**FINAL**

# Corrective Action Decision for Interim Groundwater Remediation

Kansas
Department of Health and Environment
*Environmental Remediation*

## North Industrial Corridor Site
## Wichita, Kansas

March 28, 2012

Kansas Department of Health and Environment
Environmental Remediation

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## ACRONYMS AND ABBREVIATIONS USED IN THIS DOCUMENT

| | |
|---|---|
| ARARs | Applicable or Relevant and Appropriate Requirements |
| AST | Above Ground Storage Tank |
| ATG | Alternate Treatment Goal |
| bgs | Below Ground Surface |
| CAD | Corrective Action Decision |
| CDM | Camp Dresser & McKee Inc. |
| EAB | Enhanced Anaerobic Bioremediation |
| EPA | United States Environmental Protection Agency |
| ERD | Enhanced Reductive Dechlorination |
| EUC | Environmental Use Control |
| FS | Feasibility Study |
| GWTP | Groundwater Treatment Plant |
| GWU | Groundwater Unit |
| HI | Hazard Index |
| (HRC®) | Hydrogen Release Compound |
| KDHE | Kansas Department of Health and Environment |
| MCL | Maximum Contaminant Level |
| MNA | Monitored Natural Attenuation |
| NAPL | Non-Aqueous Phase Liquid |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NIC | North Industrial Corridor Site |
| NPDES | National Pollutant Discharge Elimination System |
| NPL | National Priorities List |
| O&M | Operations and Maintenance |
| PCB | Polychlorinated Biphenyl |
| PCE | Tetrachloroethene |
| POTW | Publically Owned Treatment Works |
| PRB | Permeable Reactive Barrier |
| PRP | Potentially Responsible Party |
| RA | Remedial Action |
| RAO | Remedial Action Objective |
| RCRA | Resource Conservation and Recovery Act |
| RD | Remedial Design |
| RI | Remedial Investigation |
| RME | Reasonable Maximum Exposure |
| ROD | Record of Decision |
| RSK | Risk-Based Standards for Kansas |
| SVE | Soil Vapor Extraction |
| TCE | Trichloroethene |
| UIC | Underground Injection Control |
| USC | United States Code |
| USD | Unified School District |
| VOC | Volatile Organic Compound |
| µg/L | micrograms per Liter |

## GLOSSARY

**Administrative Record** – The body of documents that form the basis for selection of a particular response at a site. Parts of the AR are available in an information repository near the site to permit interested individuals to review the documents and to allow meaningful participation in the remedy selection process.

**Air Stripping** – The process of forcing air through polluted water to remove harmful chemicals. The air causes the chemicals to change from a liquid to a gas. The gas is collected and treated if necessary.

**Aquifer** – An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be used for drinking or other purposes. The water contained in the aquifer is called groundwater.

**Applicable or Relevant and Appropriate Requirements (ARARs)** – The federal and state environmental laws that a remedy will meet. These requirements may vary among sites and alternatives.

**Capital Costs** – Expenses associated with the initial construction of a project.

**Corrective Action Decision** – The decision document in which KDHE selects the remedy and explains the basis for selection for a site.

**Enhanced Anaerobic Bioremediation (EAB) –** the process of allowing anaerobic microbes to clean up contaminants enhanced by adding nutrients.

**Exposure -** Contact made between a chemical, physical, or biological agent and the outer boundary of an organism. Exposure is quantified as the amount of an agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut).

**Feasibility Study (FS)** – A study conducted to evaluate alternatives for cleanup of contamination.

**Groundwater** – Underground water that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

**Groundwater Unit** – An administrative unit derived through the feasibility study process to simplify the evaluation of remedial alternatives for the NIC Site.

**Hydraulic Containment** – Use of pump and treat groundwater remediation systems to hydraulically control the movement of contaminated groundwater in order to prevent continued expansion of the contamination zone.

**Maximum Contaminant Levels (MCLs)** – The maximum permissible level of a contaminant in water that is delivered to any user of a public water system.

**Monitoring** – Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. For example, monitoring wells drilled to different depths at the Site would be used to detect any migration of the plume.

**Monitored Natural Attenuation** - Allowing natural processes to remediate pollution in soil and groundwater while site conditions are routinely monitored.

**National Oil and Hazardous Substances Pollution Contingency Plan (NCP)** – The federal regulations that guide the Superfund program. These regulations can be found at 40 Code of Federal Regulations, Part 300.

**National Pollution Discharge Elimination System (NPDES)** - As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches.

**Operations and Maintenance (O&M)** – Activities conducted at a site after the construction phase to ensure that the cleanup continues to be effective.

**Plume** – A body of contaminated groundwater flowing from a specific source.

**Remedial Investigation (RI)** - A study of the source, nature and extent of contamination.

**Risk** - The probability of adverse health effects resulting from exposure to an environmental agent or mixture of agents.

**Superfund** – Federal authority established by CERCLA, to respond directly to releases or threatened releases of hazardous substances that may endanger health or welfare. Also, the common name given by the press for CERCLA because the program was well funded in the beginning.

**Tier 2 Level –** Calculated risk-based cleanup value for a specific contaminant. These values can be found in Appendix A of the *Risk-Based Standards for Kansas (RSK) Manual.*

**Threshold** - The dose or exposure below which no harmful effect is expected to occur.

**Toxicity** – A measure of degree to which a substance is harmful to human and animal life.

**Vapor Intrusion –** The migration of contaminants from the subsurface into overlying and/or adjacent buildings.

**Volatile Organic Compounds (VOCs)** – Carbon compounds, such as solvents, which readily volatilize at room temperature and atmospheric pressure. Most are not readily dissolved in water, but their solubility is above health-based standards for potable use. Some VOCs can cause cancer.

**Underground Injection Control (UIC)** - Underground injection is the technology of placing fluids underground, in porous formations of rocks, through wells or

other similar conveyance systems. While rocks such as sandstone, shale, and limestone appear to be solid, they can contain significant voids or pores that allow water and other fluids to fill and move through them. Man-made or produced fluids (liquids, gases or slurries) can move into the pores of rocks by the use of pumps or by gravity. The fluids may be water, wastewater or water mixed with chemicals.

Kansas Department of Health and Environment
Environmental Remediation

## 1. Purpose of the Final Corrective Action Decision for Interim Groundwater Remediation

The primary purposes of the final Corrective Action Decision for Interim Groundwater Remediation (CAD) for the North Industrial Corridor Site (NIC) are to: 1) summarize information from the key site documents including the Remedial Investigation[1,2] (RI) and Site-Wide Groundwater Feasibility Study[3] (FS) reports; 2) briefly describe the alternatives for site-wide groundwater remediation detailed in the FS report; 3) identify and describe the Kansas Department of Health and Environment's (KDHE) preferred remedy for groundwater; and, 4) document comments and KDHE's responses to the public comments received regarding the draft CAD. The public was encouraged to review and comment on the preferred remedy presented in the draft CAD during the public comment period held from January 6 to February 6, 2012.

**Highlight 1-1: Public Information**

*Administrative Record File*

Kansas Department of Health and Environment
Bureau of Environmental Remediation
1000 SW Jackson Street; Suite 410
Topeka, Kansas 66612-1367
Contact: Chris Carey
Phone: 785-296-0225
E-mail: ccarey@kdheks.gov
Web:
www.kdheks.gov/remedial/site_restoration/nic.html

*Local Information Repository*

City of Wichita Department of Public Works and Utilities
Environmental Health Division
1900 E. Ninth Street
Wichita, Kansas 67214
Contact: Shawn Maloney
Phone: 316-268-8351
E-mail: smaloney@wichita.gov

KDHE has selected a final remedy for the Site after reviewing and considering all information submitted during the 30-day public comment period. Camp Dresser & McKee Inc. (CDM) performed the RI and FS for the NIC Site on behalf of the City of Wichita in general accord with the Settlement Agreement between KDHE and the City of Wichita executed November 14, 1995. The public was encouraged to review and comment on the technical information presented in the RI and FS reports and other documents contained in the Administrative Record file. The Administrative Record file includes all pertinent documents and site information that form the basis and rationale for selecting the final remedy. The Administrative Record File has been made available and continues to be available for public review and copying during normal business hours at the location shown in Highlight 1-1. Also, as shown, the City of Wichita

[1] CDM, 2004, *North Industrial Corridor (NIC) Site Remedial Investigation Report*, prepared on behalf of the City of Wichita, finalized and approved April 2007.
[2] CDM, 2005, *North Industrial Corridor (NIC) Site Remedial Investigation Report Addendum*, prepared on behalf of the City of Wichita, finalized and approved April 2007.
[3] CDM, 2011, *North Industrial Corridor (NIC) Site Site-Wide Groundwater Feasibility Study*, prepared on behalf of the City of Wichita, finalized and approved August 2011.

maintains a local information repository for the NIC Site. The City's repository is available for review and copying during normal business hours.

## 2. SITE BACKGROUND

The NIC Site is an area of mixed industrial, commercial, residential, recreational, and agricultural properties located in north-central Wichita, Kansas. A long history of industrialization has left a legacy of volatile organic compounds (VOCs) in soil and groundwater throughout the area, including chlorinated solvents such as tetrachloroethene (PCE), trichloroethene (TCE), and carbon tetrachloride, as well as petroleum hydrocarbon-related contaminants, heavy metals, and others.

### *2.1. Site Location*

The NIC Site occupies approximately 4,011 acres in north-central Wichita. The NIC Site has been divided into six Groundwater Units (GWUs) to facilitate development and evaluation of remedial strategies for areas in close proximity with similar chemical and physical properties. The Site boundary and GWU boundaries are shown on Figure 2-1. Within each GWU, one or more individual source areas have been identified. Figure 2-2 identifies the various source areas and their primary contaminants of concern. Additional information regarding the status of various source area investigation and cleanup activities is available in the RI, FS, and summarized later in this document.

### *2.2. Site History*

The United States Environmental Protection Agency (EPA) first identified VOCs in groundwater in 1983 in the vicinity of 29$^{th}$ Street and Mead Street in Wichita. Several environmental investigations were conducted in the 1980s which resulted in the Site being officially listed on the National Priorities List (NPL) as the 29$^{th}$ and Mead Superfund Site in February 1990. Additional investigations conducted by KDHE, the Wichita North Industrial District Group, and the City of Wichita identified contamination in other areas adjacent to the 29$^{th}$ and Mead Site (e.g., to the south in an area known as the 13$^{th}$ and Washington Site and to the northeast of the 29$^{th}$ and Mead Site). These additional areas were consolidated to form the NIC Site.

In order to facilitate redevelopment of the NIC Site and removal of the site from the NPL, the City of Wichita and KDHE finalized a NIC Settlement Agreement in 1995. As a result of the Settlement Agreement, the 29$^{th}$ and Mead Superfund Site was officially delisted on April 29, 1996. The City created the NIC Tax Increment Finance District to fund assessment and remedial activities, and established a Certificate and Release Program to provide liability relief for innocent landowners. Local lending institutions have been encouraged to finance economic and industrial redevelopment and expansion for properties within the NIC Site. Meanwhile, the City and KDHE have systematically identified contaminant source areas and their degree of impact across the NIC Site. Many individual source areas have been identified and are in the cleanup process.

# 3. REMEDIAL INVESTIGATION

The RI was conducted by CDM in three phases. The first two phases were conducted between December 1997 and June 1998 and included: the collection of water level measurements from more than 200 locations; the collection of 1,070 direct-push groundwater samples from 513 locations; installation of 119 monitoring wells at 72 locations; sampling of 247 monitoring wells from 106 locations; and the collection of soil, surface water, sediment, indoor air, ambient air, and sludge pit samples. The third phase of the investigation was designed to further identify and characterize potential source areas and delineate the extent of the plume in the southern part of the Site. During this phase, additional water level elevation measurements, direct-push soil samples, groundwater samples, and surface water samples were collected. The sample totals presented represent work conducted by the City of Wichita/CDM. In addition to the wells sampled by the City of Wichita/CDM, a number of potentially responsible parties (PRPs) sampled their own wells at a time that coincided with the City of Wichita's efforts, and provided the collected data to the City of Wichita to be included in the site-wide evaluation.

## *3.1. Hydrogeological Setting*

Soil samples and lithologic logs collected during the RI indicate the presence of four primary hydrostratigraphic units within the NIC Site. Hydrostratigraphic Unit 1 is the uppermost unit comprised of black, brown, gray, and green clays that are locally sandy or silty. Hydrostratigraphic Unit 2 is the primary water-bearing unit encountered at the Site and consists of mostly saturated fining-upward sands. Hydrostratigraphic Unit 3 represents the weathered bedrock surface and is laterally discontinuous throughout the NIC Site. Finally, Hydrostratigraphic Unit 4 represents the competent shale bedrock (Wellington Shale) and is considered the basal lithologic unit for work conducted in the NIC Site. The depth to groundwater varies across the NIC Site ranging from less than ten feet below ground surface (bgs) in the northeastern part of the site to more than 20 feet bgs in the southern part of the site. Groundwater flow is predominantly to the south with localized westerly, southwesterly, and southeasterly flow components. Figure 3-1 depicts the potentiometric surface in the vicinity in the NIC Site and also shows the locations of streams and other surface water bodies within the Site. Groundwater flow is strongly influenced by Chisholm Creek in the southeastern part of the site.

The branches and tributaries to Chisholm Creek are the principal streams within the NIC Site. The majority of these streams within the NIC Site are gaining streams, meaning that groundwater discharges to surface water. Ultimately, surface water in Chisholm Creek discharges to the Arkansas River south of the Site near the intersection of Interstate 135 and Kansas Highway 15.

## *3.2. Summary of Site-Wide Groundwater Investigation Results*

The data collected through the RI and other investigations within the NIC site identifies a large chlorinated solvent plume extending from north of 37$^{th}$ Street North to the southern site boundary. Although there are many contaminants present in the NIC Site, for the purposes of site-wide groundwater remediation, a list of groundwater target compounds has been developed based on their frequency of detection, exceedance of applicable threshold levels, extent of

contamination, usability in source identification, and importance as a biodegradation product. Table 3-1 presents a summary of analytical results for these contaminants. It should be noted that all chemicals detected at concentrations above KDHE's Tier 2 Levels[4] remain contaminants of concern for the NIC Site, this includes contaminants associated with individual source areas but not widespread throughout the NIC Site (e.g., polychlorinated biphenyls (PCBs), etc.). In the interest of brevity, only figures depicting TCE concentrations, the most prevalent contaminant at the NIC site, are presented herein. Figure 3-2 presents the orientation of the shallow TCE plume. Figure 3-3 presents the orientation of the deep TCE plume. Additional tables and figures are available in the FS. As shown, the TCE plume emanates from various sources within the NIC Site and extends from north of 37th Street North to the southern NIC boundary (2nd/3rd Streets North).

In general, contaminant concentrations within the body of the NIC chlorinated solvent plume have decreased over the period of record as a result of ongoing source abatement measures and natural processes. The City of Wichita collected data to evaluate the potential for natural attenuation processes to restore groundwater at the site in 2001 and 2007-8. When these data are evaluated with respect to the EPA's *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater*[5] they suggest that natural processes alone will not be sufficient to address the NIC plume in total; however, direct lines of evidence for natural attenuation have been observed in the vicinity of the former Coastal Derby Refinery Site in GWU-5. The data indicate that the presence of petroleum hydrocarbons in this area may help facilitate reductive dechlorination of chlorinated solvents. Additional data are needed to complete the evaluation of natural attenuation processes in this area.

### 3.3. Identification of Source Areas

In the RI report, CDM classified source areas as Suspected, Identified, or Confirmed on the basis of available data. CDM definitions for each classification are provided below:

> ***Confirmed:*** *source areas with identified groundwater impact and either identified soil impact or confirmed use or storage of contaminant-related chemical(s) on the property.*
>
> ***Identified:*** *source areas with groundwater data that implicate a specific release area; generally confined to a single property. The identified source area lacks confirmatory soil data and information that conclusively demonstrates the use or storage of contaminant-related chemical(s) on the property.*

[4] KDHE, 2010, *Risk-Based Standards for Kansas (RSK) Manual*,5th Version, Kansas Department of Health and Environment, October 2010.

[5] EPA, 1998, *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater* (EPA/600/R-98/128), United States Environmental Protection Agency, Office of Research and Development, Washington, DC, September.

***Suspected:*** *source areas with groundwater data which indicate that a release to groundwater may have occurred but lack sufficient data to identify a specific property or release area. A suspected source area will generally be larger in size than an identified source area and will also lack confirmatory soil data and information that conclusively demonstrates the use or storage of contaminant-related chemical(s) on the property.*

Figure 3-4 identifies the Confirmed, Identified, and Suspected source areas along with the primary source contaminants in the NIC Site. To date, the City of Wichita has identified 46 source areas within the NIC Site; however, KDHE anticipates that additional sources may be identified as remedial actions progress. Source investigation and abatement activities at PRP-lead sites are not addressed through the NIC Settlement Agreement, but rather individual agreements or orders between the PRP and KDHE. At present, KDHE and/or EPA is working (or has worked) with PRPs to evaluate and remedy environmental contamination through such agreements at 18 such sites. Administrative actions for other source areas are in process. Table 1-2 of the FS provides additional information regarding source areas in the NIC Site.

The NIC Settlement Agreement requires the KDHE to use its best efforts to encourage PRPs who have not been issued a Certificate of Release pursuant to the Settlement Agreement to participate with the City in its efforts to investigate and remediate contamination within the NIC Site; however, in some cases, no viable PRPs remain for a site. In such cases, the City of Wichita is responsible for conducting the source area investigation and remediation. To date, two such source areas (i.e., Apex Engineering and VIM Trailer) have been referred back to the City of Wichita for response.

Although source area remedial actions will be the subject of future decision documents, KDHE's general expectation for source area remedial actions is that they address all contamination at the subject property and address contamination which has migrated away from the facility that remains at concentrations well in excess of applicable threshold levels.

### 3.4. Delineation of Groundwater Units

Based on site hydrogeology, RI findings, and other administrative considerations, the City of Wichita proposed to divide the NIC Site into six groundwater units to streamline the evaluation and eventual selection of remedial actions for the NIC Site as shown on Figure 2-1.

- *Groundwater Unit 1 (GWU-1)* – GWU-1 is generally defined by the detections of chlorinated solvents at concentrations exceeding KDHE's Tier 2 Levels for Groundwater in the northeastern part of the NIC Site. Although the GWU-1 boundary terminates at the north boundary of the former Coastal Derby Refinery Site, KDHE and the City of Wichita agree that contamination associated with GWU-1 that migrates beyond the GWU-1 boundary will be addressed as part of the GWU-1 remedial action. Confirmed source areas within GWU-1 include: Coleman Northeast, UPRR Fueling Facility, Safety-Kleen/Clean Harbors, Farmland Elevator W, VIM Trailer, and Unocal. There are other

potential source areas (e.g., suspected or identified) in the GWU as discussed in the RI and FS.

- *Groundwater Unit 2 (GWU-2)* – GWU-2 is generally defined by the detections of chlorinated solvents at concentrations exceeding KDHE's Tier 2 Levels for Groundwater in the northwestern part of the NIC Site; however, primary source contaminants for several refinery-related source areas within GWU-2 are associated with petroleum hydrocarbons. GWU-2 is bounded by Broadway Avenue on the west, GWU-1 to the east, and extends towards 17th Street and Cleveland to the south. Confirmed source areas within GWU-2 include: Love Box, Continental Tank Car, Coleman North, Former Golden Rule Refinery, Former Coastal Boneyard, Former Barnsdall Refinery, and Novick Iron and Metal. There are other potential source areas (e.g., suspected or identified) in the GWU as discussed in the RI and FS.

- *Groundwater Unit 3 (GWU-3)* – GWU-3 incorporates the majority of the NIC plume south of GWUs 1 and 2 and extends to the southern NIC boundary. GWU-3 is generally bounded by Broadway on the west and Chisholm Creek on the east. The south-southwestern boundary of GWU-2 forms the northern boundary of GWU-3. Confirmed source areas within GWU-3 include: Brenntag (i.e., HCI Advance Chemical), Cargill, Aero Space Controls, Via Christi, and Christopher Steel, Inc. There are other potential source areas (e.g., suspected or identified) in the GWU as discussed in the RI and FS.

- *Groundwater Unit 4 (GWU-4)* – GWU-4 is located west of GWU-3 and incorporates contamination associated with the Apex Engineering Site and Waco Handi-Wash dry cleaning facility. GWU-4 extends to the southern NIC boundary.

- *Groundwater Unit 5 (GWU-5)* – GWU-5 consists of the former Coastal Derby Refinery Site located adjacent to the East Fork of Chisholm Creek between GWU-1 and GWU-2. The focus of investigative and remedial actions in GWU-5 are refinery-related contaminants. Chlorinated solvent contamination from GWU-1 has migrated into and beyond the geographic boundaries of GWU-5 and will be addressed as part of the GWU-1 remedial action.

- *Groundwater Unit 6 (GWU-6)* – GWU-6 consists of the Unified School District (USD) 259 School Service Center Site located directly north of GWU-1 and east of GWU-2. Available data indicates that contamination associated with the USD 259 Site remains separate from other solvent contamination in the area.

### *3.5. Vapor Intrusion Assessment*

During the RI, CDM collected samples to evaluate the potential for vapor intrusion from the subsurface to indoor air. Separately, limited vapor intrusion assessment efforts have been conducted on a source-area specific basis by others, including KDHE. Together, the data indicate that vapor intrusion could pose an unacceptable health threat in some areas of the Site and that further evaluation of this pathway is warranted. As of the date of this document, KDHE

is working with the City of Wichita to determine the scope of and protocols for the vapor intrusion assessment. The assessment and any resultant mitigation efforts will be addressed as a separate operable unit for the NIC Site and may be the subject of a separate decision document.

## 4. SOURCE ABATEMENT AND INTERIM MEASURE IMPLEMENTATION

Interim measures are actions or activities taken to quickly prevent, mitigate, or remedy unacceptable risk(s) posed to human health and/or the environment by an actual or potential release of a hazardous substance, pollutant, or contaminant. The City of Wichita has not implemented any Site-wide interim measures to address contamination at the NIC Site; however, many of the responsible parties for sources areas within the NIC Site have taken implemented interim measures or source area remedial actions. Additional information regarding source abatement efforts is available in Appendix B of the FS and the Administrative Record files for subject source areas.

### *4.1. Groundwater Unit 1 Interim Measures*

#### *4.1.1. Coleman Northeast*

Several interim measures and pilot tests have been implemented at the Coleman Northeast Site since contamination was identified in 1991. In 1995, a hydraulic containment system was installed which consists of three groundwater recovery wells in the southwest part of their facility. Groundwater recovered from these wells is treated by air stripping before discharge under National Pollutant Discharge Elimination System (NPDES) permit to a drainage ditch. As of June 2011, the system has treated 680,608,400 gallons of contaminated groundwater.

In 2003, a soil shredding interim measure was implemented to address contamination at Site 1B. Contaminated soil was excavated to a depth of 15 feet below grade and treated to below KDHE's Tier 2 Levels for the Soil-to-Groundwater Protection Pathway using a mechanical/grinding process. Treated soils were returned to the excavation as backfill. A soil vapor extraction (SVE) pilot test was performed at Site 3 to evaluate the potential effectiveness of this technology in 2005. The resultant data indicated that SVE was partially effective but not appropriate for full-scale implementation at Site 3.

Enhanced reductive dechlorination (ERD) pilot testing to address residual groundwater contamination in this area was initiated in 2007 and is ongoing. The study is evaluating the potential to develop an in situ reactive zone that would promote ERD. The results to date indicate that ERD could be effective at reducing groundwater contaminant concentrations.

#### *4.1.2. Farmland Elevator W*

The former Farmland Elevator W facility is a source of carbon tetrachloride contamination in GWU-1. In 2001, Farmland removed the facility's subsurface sewer system and associated piping and provided a public water supply connection to the facility. Farmland Industries (FI) declared bankruptcy in May 2002 and the FI Kansas Remediation Trust (Trust) was formed to address remaining environmental issues. In 2005, the Trust implemented a focused soil

excavation interim measure to address the principal carbon tetrachloride hotspot at the facility; however, facility infrastructure precluded removal of all contaminated soils. Although contaminant concentrations still exceed the maximum contaminant level (MCL), available data indicate that the soil interim measure was successful at reducing contaminant concentrations in groundwater.

### 4.1.3. Safety-Kleen/Clean Harbors Facility

Remedial activities at the Safety-Kleen Site are directly overseen by EPA's Resource Conservation and Recovery Act (RCRA) Corrective Action program with state support. Source abatement activities at this source area are limited to excavation and offsite disposal of the paint can burial pit (Solid Waste Management Unit 20).

### 4.1.4. Unocal

Numerous interim measures and pilot tests (some of which were full scale equivalents) have been implemented at the Unocal Site since contamination was identified in 1989. In response to a November 1989 PCE spill, a SVE system consisting of vertical vapor extraction wells was installed. The SVE system operated until 1994 when it was replaced by a horizontal SVE system. The horizontal SVE system was decommissioned in the late 1990s.

In 1994, a groundwater pump and treat system was installed to address source area contamination and provide hydraulic control downgradient of the Unocal facility. Groundwater was extracted from 12 wells, treated through an air stripper, and discharged to the City of Wichita Publicly Owned Treatment Works (POTW). The system was decommissioned in 2006, when the permit to discharge to the POTW expired. A total of 27,871,421 gallons of groundwater was recovered and treated during system operations.

In September 1999, an enhanced bioremediation pilot treatability test was initiated to evaluate the efficacy of injecting Hydrogen Release Compound (HRC®) to encourage reductive dechlorination. Current data for the site indicate that injections continue to be effective, as contaminant concentrations have remained at or near KDHE residential Tier 2 Levels in the study area.

In 2001, source area soil removal activities were initiated to address vadose zone soil contamination. Excavation activities were terminated at the saturated zone. Three areas were excavated including an area extending from the Site entrance to the northwestern warehouse, an area north of the bioremediation pilot test, and a portion of the former Above Ground Storage Tank (AST) farm. 5,309 tons of contaminated soil was disposed as hazardous waste at the Lone Mountain Landfill in Waynoka, Oklahoma.

A second enhanced reductive dechlorination pilot test was implemented once the groundwater extraction system was decommissioned to meet the objectives of the extraction system by preventing plume migration. Two compounds were injected to facilitate a side-by-side comparison: HRC® was used in the downgradient transect and CAP18-ME™ was used in the

upgradient transect. The test found that HRC® was successful at reducing concentrations of PCE and TCE. Based on the results of the 1999 pilot test, it is expected that concentrations of cis-1,2-DCE and vinyl chloride will decrease over time. CAP18-ME™ was not determined to be effective for quickly reducing contaminant concentrations. Wells associated with both transects will continue to be sampled for performance monitoring purposes.

In December 2009, an enhanced reductive dechlorination interim measure was implemented in the eastern source area. A mixture of HRC® [eXtended release formula] and glycerol was injected throughout the saturated zone in four transects through the source area. Performance monitoring of this interim measure is ongoing.

In early 2010, a phytoremediation interim measure was implemented which addresses contamination in the western and central part of the Unocal Site, where the bedrock surface is relatively shallow. The phytoremediation system is designed to create a hydraulic barrier to mitigate off-site contaminant migration and to remove dissolved-phase contaminants through various processes, including rhizodegradation and phytovolatiliation. The phytoremediation tree stands have been designed to preclude the migration of contaminated groundwater outside of the area of influence during the dormant season. Performance monitoring of this interim measure is ongoing.

## 4.2. Groundwater Unit 2 Interim Measures and Remedial Actions

### 4.2.1. Coleman North

In 1988, KDHE and EPA worked with Coleman to implement a groundwater extraction and treatment interim measure and a SVE system to address contaminated soils at the Coleman North Site (also known as the Coleman Operable Unit). Contaminated groundwater is extracted by an industrial well, piped into the facility in a closed system to be used as coolant for research and development purposes by the current facility operator, and then piped to an air stripper for treatment before being discharged under a NPDES permit. A second groundwater extraction well south of the industrial well provides containment of contaminated groundwater, which is pumped to the air stipper for treatment prior to discharge of a NPDES permit. EPA issued a Record of Decision (ROD) for the Coleman North Site in 1992 and in 1997 an enhanced groundwater extraction and treatment system came online. In addition, SVE systems were installed at other sources areas identified at the Coleman North Site. To date, several of the SVE systems have been shut down based on their successful performance. Groundwater extraction and treatment is ongoing.

### 4.2.2. Johns' Refinery

Contamination at the former Johns' Refinery facility was addressed through a removal action by EPA's Emergency Response Branch in the 1980s. The removal action included disposal of residual wastes, dismantling and removing above and below ground tanks, and excavating contaminated soil containing heavy metals, petroleum hydrocarbons, and PCBs. The excavation was backfilled with clean clay and topped with gravel.

### 4.2.3. Novick Iron and Metal

Interim measures at the Novick Iron and Metal Site have been limited to targeted soil excavations to address hydrocarbon contamination. Plans for additional soil excavation interim measures to address PCB-impacted soil are currently under development.

## 4.3. Groundwater Unit 3 Interim Measures and Remedial Actions

### 4.3.1. Brenntag

In 2007 Brenntag excavated approximately 683 cubic yards of concrete and contaminated soil from the south yard of their facility. Contaminated soil was disposed of as special waste at Rolling Meadows Recycling and Disposal Facility in Topeka, Kansas. To date, it appears that soil removal activities resulted in a substantial decrease in groundwater contaminant concentrations resulting in a separation between residual low-level groundwater concentration at the Brenntag facility and relatively higher concentrations downgradient of their facility.

### 4.3.2. Cargill Flour Milling Facility

In 2007, Cargill installed two permeable reactive barriers (PRBs) to facilitate in situ reductive dechlorination of carbon tetrachloride in groundwater. PRBs were installed by injecting EHC®, a mixture of zero-valent iron and organic amendments, throughout the saturated zone under an underground injection control permit. One PRB was installed immediately downgradient of the suspected source areas while the other PRB was installed more proximal to the downgradient property boundary to preclude further offsite migration. Since installation, carbon tetrachloride concentrations in the source area have decreased from a maximum concentration of 2,470 micrograms per Liter (µg/L) in 2007 to 59.3 µg/L in early 2011.

### 4.3.3. Via Christi

Source control efforts at this site are limited to focused excavation and offsite disposal of lead-contaminated soils adjacent to the facility. Environmental Use Controls (EUCs) have been established for other parts of the Via Christi facility.

## 4.4. Groundwater Unit 4 Interim Measures

No interim measures have been implemented in GWU-4 to date.

## 4.5. Groundwater Unit 5 Interim Measures

The Former Coastal Derby Refinery is the source of petroleum hydrocarbon-related contamination identified in GWU-5. To date, various interim measures have been implemented to recover non-aqueous phase liquid (NAPL) and contaminated groundwater.

Operation of the former vertical well NAPL recovery system began in the 1980s and ceased operation in 2004, to facilitate refinery demolition. This system was augmented several times to enhance product recovery and groundwater management. Groundwater recovered by this system was either reinjected through a reinjection well array on the upgradient boundary of the site or treated by air stripping and discharged to an Unnamed Tributary to the West Fork of Chisholm

Creek under a NPDES permit. Also in the 1980s, a trench was installed for product recovery south of 21st Street North. It is estimated that 2,500,000 gallons of NAPL were recovered during this timeframe from the vertical recovery well system and south trench.

In 2006, construction began on three seep interceptor trenches along the East Fork of Chisholm Creek and a new air stripper tank farm. The new trenches became operational in June 2007. As suggested, the primary purpose of these trenches was to eliminate NAPL seeps into the creek by recovering product and lowering the water table to create a cone of depression around the trench. The seep interceptor trenches have been largely effective; however, residual NAPL between the trench and the East Fork of Chisholm Creek infrequently surfaces along the Creek. An additional trench was installed parallel to 21st Street North in 2007 for product recovery. Concurrently, the trench south of 21st Street North was upgraded to incorporate groundwater depression to enhance product recovery. In total, the vertical and trench groundwater and product recovery systems have recovered 1,508,508,000 gallons of contaminated groundwater and 2,648,762 gallons of NAPL.

### *4.6. Groundwater Unit 6 Interim Measures*

USD 259's School Service Center Site is the source of contamination identified in GWU-6. To date, USD 259 has implemented significant soil and groundwater interim measures and pilot tests to expedite the overall cleanup of the site.

In 1982 and again in 1992 underground storage tanks storing solvents and kerosene were removed. Additional soil from the tank basin was also removed at that time. In 2000, 410 cubic yards of impacted soil adjacent to the former tank basin was removed and disposed offsite as an interim measure. Available data indicate that soil

### Highlight 5-1: How to Quantify Risk

The risk assessment consists of a four step process as follows: 1) analyze the contamination; 2) estimate the exposure; 3) assess potential health dangers and 4) characterize the site risks.

In Step 1, comparisons are made between site-specific concentrations and health-based standards to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, different ways people might be exposed to contaminants are identified. Concentrations, frequency, and the duration of exposure are used to calculate the reasonable maximum exposure, which portrays the highest level of exposure that could be reasonably expected to occur.

In Step 3, information from Step 2 is combined with toxicity information for each chemical to assess potential health risks. The Agencies consider two types of risk: cancer and non-cancer. The likelihood of any kind of cancer resulting from a site is generally expressed as an upper bound probability; for example, a 1 in 10,000 chance. In other words for every 10,000 people exposed, one extra cancer risk may occur as a result. For non-cancer effects, a hazard index is calculated. The key concept here is that a hazard index less than one, or "threshold level" predicts that no non-cancer effects will occur.

In Step 4, the results of the previous steps are combined, evaluated, and summarized into a total site risk. The Agencies then determine if the site risk requires action to prevent exposure to the contaminants.

contamination may remain under the School Service Center building.

In 2003, work began on an in situ bioremediation groundwater interim measure and ethanol and sodium lactate were injected into the aquifer. Later, in 2004, the aquifer was inoculated using Bio-Dechlor INOCULUM$^{TM}$. Based on the results of the injections, only partial dechlorination of PCE was occurring and in 2006, the aquifer was inoculated using GeoSynSirem KB-1 and nutrients. Plans are underway to expand the existing groundwater interim measure to full-scale and to install a permeable reactive barrier at the downgradient edge of the USD 259 property to preclude further migration of the contaminant plume.

## 5. Site Risks

RI data were used to develop a Baseline Risk Assessment[6] for the NIC Site. The risk assessment evaluated potential health risks posed by contamination at the NIC Site in the absence of remediation. The predominant focus of the risk assessment was risks associated with site-wide groundwater contamination (i.e., ingestion, dermal contact, and inhalation); however, the risk assessment included a screening level evaluation of risks posed by exposure to surface water and sediment. The risk assessment divided the Site into two exposure areas (i.e., north and south of 17$^{th}$ Street North). The risk assessment did not evaluate risks posed by soil and/or groundwater at individual source areas (where the highest contaminant levels may be found) and may therefore underestimate risks posed in these areas. Therefore, individual risk assessments have been (or may be) undertaken as needed on a source-area specific basis.

Table 5-1 presents a summary of risk assessment findings. In general, the risk assessment found that groundwater at the NIC Site poses a threat to potential current and future receptors. The cancer risk posed to residents using the water for domestic purposes (e.g., drinking, dermal contact, and inhalation) was $2x10^{-2}$ for both exposure areas which far exceeds EPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$. Non-cancer health risks (i.e., hazard indices, HI) for residents using the water for domestic purposes far exceeded one for a number of chemicals, including benzene, carbon tetrachloride, and TCE, among others. Total cancer risks for current or future residents who use groundwater solely for outdoor purposes for the exposure areas north and south of 17$^{th}$ Street North were $7x10^{-5}$ and $4x10^{-5}$, respectively, falling within EPA's acceptable risk range. Non-cancer health risks for current or future residents under the outdoor use scenario for these areas were 4 and 3, respectively, exceeding one.

Similarly, contaminants in groundwater pose an unacceptable risk to current and future commercial/industrial workers who use groundwater as a source of drinking water or for showering. Cancer risks for this exposure scenario in the northern part of the site were $3x10^{-3}$ and in the southern part of the site were $2x10^{-3}$. Hazard indices exceeded one for both exposure areas.

[6] CDM, 2004, *Baseline Risk Assessment for the North Industrial Corridor Site*, prepared on behalf of the City of Wichita, finalized and approved March 2007.

The risk assessment found that the vapor migration from the subsurface to indoor air posed *no risk* to potential receptors; however, KDHE has since determined that the data evaluated in the risk assessment were insufficient to support that determination. The City of Wichita has agreed to conduct additional testing to facilitate a more thorough evaluation of the vapor intrusion pathway as a separate NIC operable unit.

As indicated above, the primary site-wide exposure pathway to site contaminants is through the use of groundwater contaminated with VOCs or, potentially, through inhalation of vapors sourced from groundwater contamination. The City of Wichita Municipal Code of Ordinances, Title 7, Chapter 7.30, Section 7.30.105 currently prohibits the installation of new wells and use of pre-existing water wells for personal use in contaminated areas (such as the NIC Site); however, groundwater may be a future source of drinking water.

**Highlight 6-1: Remedial Action Objectives for Interim Groundwater Remediation**

The remedial action objectives for interim groundwater remediation at the NIC Site are to:

- Prevent exposure to groundwater that is contaminated above acceptable levels;
- Prevent or minimize further migration of the contaminant plume; and,
- Restore groundwater to allow for its most beneficial uses (e.g., drinking water).

## 6. Remedial Action Objectives

Remedial Action Objectives (RAOs) are media-specific goals for protecting human health and the environment. RAOs are developed through evaluation of applicable and relevant and appropriate requirements (ARARs) and To Be Considered standards with consideration of the findings of the RI and human health and ecological risk assessment. RAOs for the site-wide groundwater contamination in the NIC Site are summarized in Highlight 6-1. In addition, should future surface water monitoring data indicate that the discharge of contaminated groundwater to surface water results in elevated contaminant concentrations in surface water, (i.e., as defined by the Kansas Surface Water Quality Standards[7] including the numerical thresholds and the Kansas Antidegradation Policy), KDHE may require additional actions to prevent or minimize further degradation of the surface water resource. Although the focus of this draft CAD is on site-wide groundwater contamination, an integral part of any site-wide remedy is the timely control of source area contamination. To ensure consistency among future source abatement actions and limit redundancy between source abatement and site-wide remedial actions, source area RAOs will be established to protect human health and the environment, prevent leaching of contaminants from soil to groundwater at concentrations above final site-wide cleanup levels for groundwater, address NAPL, where encountered, and address contamination which has migrated

[7] Kansas Surface Water Quality Standards, K.A.R. 28-16-28b. et seq.

beyond facility boundaries and remains at concentrations significantly above respective threshold levels.

### 6.1. Cleanup Levels

For groundwater cleanups being conducted at sites with drinking water aquifers, federally promulgated MCLs are operable. Even though groundwater in the vicinity of the NIC Site is not currently used for drinking purposes, it is a potential source of drinking water in the future. Therefore, MCLs, where available, and KDHE's Tier 2 Levels for Groundwater as specified in the current version of the *Risk-Based Standards for Kansas (RSK)Manual(4)* for those constituents for which EPA has not established MCLs, are the final remedial goals for groundwater. However, since the City of Wichita has restrictions in place precluding the use of groundwater for drinking purposes, an alternate treatment goal (ATG) has been established for TCE of 21 µg/L within the boundaries of the NIC Site. The ATG is intended to focus on the areas of the NIC site where remediation is required; however, continued remedial system operations beyond these levels or cleanup activities in other areas may be necessary to control plume migration, mitigate impacts to other environmental media, and/or as otherwise needed to protect human health and the environment. Table 6-1 summarizes groundwater cleanup levels for groundwater target compounds for interim groundwater remediation.

## 7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

Through the FS process, individual remedial action alternatives were first evaluated with respect to their ability to satisfy the following criteria as specified in the *National Oil and Hazardous Substances Contingency Plan*[8] (NCP): protection of human health and the environment, compliance with ARARs; long-term effectiveness and permanence, reduction of toxicity mobility or volume through treatment; short-term effectiveness; implementability; and, cost. The alternatives for each alternative were then compared against one another to facilitate the identification of the preferred alternative for each GWU. A detailed description of the various remedial action alternatives and the individual and comparative analyses is presented in the FS.

There are a number of common elements among the various alternatives evaluated. These common elements include institutional controls precluding the installation or use of groundwater wells within the NIC Site for drinking purposes, groundwater monitoring, and implementation of individual source abatement measures. While there may be some variations between the various alternatives, these common elements are not discussed in detail in the summary below but will be retained in KDHE's preferred remedy.

The NCP requires the evaluation of a No Action alternative to serve as a baseline for comparison to other remedial action alternatives evaluated. Typically, the No Action alternative means the site is left unchanged, and no remedial actions are evaluated or taken at the site; however, for the purpose of the FS, the No Action alternative includes source abatement, limited environmental monitoring, periodic reviews, followed by plugging and abandonment of monitoring well

[8] National Oil and Hazardous Substances Contingency Plan, 40 CFR 300 et seq.

networks in the remedial alternatives evaluated for GWUs 1, 3 and 4, and source abatement measures only for GWU-2. The No Action alternative for each GWU is discussed further in the summary of remedial alternatives evaluated below.

### 7.1. Groundwater Unit 1

Four remedial action alternatives were retained for detailed analysis for GWU-1. These include Alternative GWU1-1 – No Action; Alternative GWU1-2 – Monitored Natural Attenuation; GWU1-3 – Enhanced Anaerobic Bioremediation/Monitored Natural Attenuation; and, GWU1-4 – Groundwater Extraction (Containment Only), New Treatment Plant, and Discharge to Chisholm Creek.

#### 7.1.1. Alternative GWU1-1 – No Action

For the purpose of the FS, for GWU-1, the No Action alternative included source abatement measures, limited environmental monitoring, and periodic reviews for a period of 70 years followed by plugging and abandonment of the monitoring well network. The present value cost of Alternative GWU1-1 is $2,191,000.

**Highlight 7-1 – Monitored Natural Attenuation**

Monitored Natural Attenuation (MNA) relies on a suite of natural attenuation processes to reduce contaminant concentrations to acceptable levels. Without the right conditions, however, MNA will not be quick or effective enough to serve as an independent remedy. Primary natural attenuation processes include biodegradation, dispersion, dilution, and absorption. KDHE and EPA have taken the position that the biological component must be active to support selection of MNA alone as the preferred remedy.

At the NIC Site, sufficient data have not been collected to support selection of MNA as the preferred alternative without further study and evaluation. KDHE and the City of Wichita have agreed that some areas warrant further study of natural attenuation processes in the future.

#### 7.1.2. Alternative GWU1-2 – Monitored Natural Attenuation (MNA)

This alternative does not include any upfront active treatment or remediation beyond source control to reduce the toxicity, mobility, or volume of groundwater contamination. Instead, it relies on natural attenuation processes, including biodegradation, dispersion, dilution, and absorption, to reduce contaminant concentrations in groundwater. Groundwater will be periodically monitored for contaminant concentrations as well as natural attenuation indicator parameters for the purpose of evaluating: ongoing reducing anaerobic groundwater conditions; decreasing overall trends in contaminant trends; and, observed degradation of primary contaminants of concern to daughter products (e.g., TCE to cis-1,2-dichloroethene). Although the existing MNA data are limited, historical results in proximity to the former refinery downgradient of GWU-1, suggest that MNA may be most effective in that area. This alternative also incorporates contingency investigation of NIC contaminants detected east of the East Fork of Chisholm Creek and subsequent remediation of any such impacts using enhanced anaerobic bioremediation (EAB), as discussed further under Alternative GWU1-3, to the extent such the

impacts will not be addressed by other source control measures. Periodic groundwater sampling and site reviews would be conducted throughout the remedial action, assumed to be 70 years, to document the effectiveness of the groundwater remedial strategy. The present value cost of Alternative GWU1-2, not including contingency implementation, is $5,532,000.

### 7.1.3. Alternative GWU1-3 – Enhanced Anaerobic Bioremediation/Monitored Natural Attenuation

This alternative provides treatment of the GWU-3 plume by enhancing reductive dechlorination processes. These processes would be enhanced by using injection wells arranged in four biobarriers to introduce electron donor material to the aquifer under an Underground Injection Control (UIC) permit, focusing on areas where contaminant concentrations exceed 100 µg/L. The alternative relies on natural attenuation processes to address contamination below this cumulative threshold. It is anticipated that three injection events will be required to reduce contaminant concentrations to below MCLs within the treatment area. This alternative also incorporates contingency investigation of NIC contaminants detected east of the East Fork of Chisholm Creek and subsequent remediation of any such impacts using EAB to the extent such the impacts will not be addressed by other source control measures. Pilot testing will be necessary to determine the optimal injection well configuration and composition of injected material. Although EAB treatment is anticipated to take about 10 years, periodic site reviews and additional groundwater monitoring outside the proposed treatment area will be ongoing for approximately 70 years. The present value cost of Alternative GWU1-3, not including contingency implementation, is $9,465,000.

**Highlight 7-2 –Bioremediation**

Bioremediation relies on natural biological processes to breakdown harmful chemicals in the subsurface. Throughout this CAD bioremediation is referred to as enhanced reductive dechlorination (ERD) and enhanced anaerobic bioremediation (EAB).

In order for bioremediation to be successful, the right microbes, nutrients, temperature and amount of oxygen must be present. Different microbes are needed depending on the contaminants present at a Site. It is often necessary to add amendments, microbes, or other organic source material to the aquifer to allow microbes to thrive and to speed up bioremediation processes. To determine what enhancements are necessary, pilot testing is often conducted. Because remediation is conducted in the subsurface, bioremediation-based remedies largely reduce the amount of wastes generated from a contaminated site.

### 7.1.4. Alternative GWU1-4 – Groundwater Extraction (Containment Only), New Treatment Plant, and Discharge to Chisholm Creek

Under this alternative, an extraction well pumping at a rate of approximately 50 gallons per minute would be installed along 29th Street North to contain contamination in the northern part of

GWU-1; contamination south of 29th Street North would be subject to MNA as described under Alternative GWU1-2. Groundwater extracted from the recovery well would be pumped to a new treatment plant with an air stripper and discharged under a NPDES permit to an Unnamed Tributary to the West Fork of Chisholm Creek (identified as the 'middle fork' in the FS). Periodic groundwater sampling and site reviews would be conducted throughout the remedial action to monitor the effectiveness of the groundwater remedial strategy. The operational timeframe for the recovery well is approximately 35 years; monitoring activities are expected to continue for 42 years. This alternative also incorporates contingency investigation of NIC contaminants detected east of the East Fork of Chisholm Creek and subsequent remediation of any such impacts using EAB, as discussed under Alternative GWU1-3, to the extent such the impacts will not be addressed by other source control measures. In addition, a second contingency recovery well may be installed should MNA prove ineffective. The present value cost of Alternative GWU1-4, not including contingency implementation, is $8,497,000.

**Highlight 7-3 – Groundwater Extraction and Treatment**

Groundwater extraction and treatment, also known as 'pump and treat' involves: (1) bringing contaminated groundwater to the surface using wells equipped with pumps; (2) treating the water above ground (i.e., air stripping has been recommended for the NIC Site); (3) testing the water to make sure contaminants have been removed; and, (4) discharging the clean water to an acceptable location.

Two pump and treat scenarios have been evaluated for some parts of the NIC Site (containment and in-plume treatment). For these alternatives, containment refers to the installation of wells at the downgradient edge of the plume to prevent further spreading of the contaminant plume without any additional treatment in upgradient areas. The in-plume treatment scenarios add one or more wells in upgradient areas to facilitate mass removal and in some cases more timely restoration of the groundwater resource.

### *7.2. Groundwater Unit 2*

Five remedial action alternatives were evaluated for GWU-2. These include: GWU2-1 – No Action; GWU2-2 – Plume Stability Monitoring; GWU2-3 – Enhanced Bioremediation; and GWU2-4a,b – Groundwater Extraction and Treatment.

#### *7.2.1. Alternative GWU2-1 – No Action*

For the purpose of the FS, for GWU-2, the No Action alternative included source abatement measures and no separate environmental monitoring, periodic reviews or well plugging and abandonment. The estimated cost of GWU2-1 is $0[9].

[9] It should be noted that the evaluation of remedial alternatives for GWU-2 was prepared by Shaw Environmental while the remainder of the FS was prepared by CDM. The cost estimate for GWU2-1 is truly limited to no actions

### 7.2.2. Alternative GWU2-2 – Plume Stability Monitoring

This alternative does not include any upfront active treatment or remediation beyond source control to reduce the toxicity, mobility, or volume of groundwater contamination. Instead, it relies on natural attenuation processes, including biodegradation, dispersion, dilution, and absorption, to reduce contaminant concentrations in groundwater and incorporates systematic monitoring of groundwater to evaluate if contaminant concentrations decrease over time. This alternative includes groundwater monitoring and statistical trend analyses to evaluate the effectiveness of the remedial strategy for a period of 50 years. The present value cost of Alternative GWU2-2 is $1,348,199.

### 7.2.3. Alternative GWU2-3 – Enhanced Bioremediation

This alternative consists of the injection of a carbon substrate through a network of wells to enhance or accelerate bioremediation processes. Although this alternative meets some preliminary screening criteria, it was eliminated from further consideration based on observed groundwater concentration trends (i.e., contaminant concentrations may not be sufficient to facilitate successful bioremediation), property access issues, aquifer characteristics and cost. No specific operational or cost information is available.

### 7.2.4. Alternative GWU2-4a,b– Groundwater Extraction and Treatment

This alternative evaluated two separate groundwater extraction and treatment configurations. Under Alternative GWU2-4a, a single groundwater extraction well would be installed south of 21st Street North with the primary goal of capturing contamination at concentrations above ATGs upgradient of the Van Waters and Rogers South facility. This well is anticipated to pump at a rate of approximately 150 gallons per minute for an operational time frame of approximately 42 years. Alternative GWU2-4b adds one additional well near 19th and Mosley intended to capture groundwater contamination upgradient of this area. The additional well is anticipated to pump at a rate of 200 gallons per minute for an operational time frame of approximately 28 years. Contaminated groundwater would be pumped to a new treatment plant with an air stripper and discharged to Chisholm Creek under a NPDES permit. Both configurations incorporate plume stability monitoring as discussed under Alternative GWU2-2. The present value costs for Alternatives GW2-4a and GW2-4b are $3,501,076 and $5,150,041, respectively.

## 7.3. Groundwater Unit 3

Five remedial action alternatives were retained for detailed analysis for GWU-3. Other than the requisite No Action alternative (GWU3-1), each alternative was a variation of groundwater extraction and treatment: GWU3-2 – Groundwater Extraction (Containment Only), Discharge after Treatment at the Gilbert and Mosley Groundwater Treatment Plant (GWTP); GWU3-3 – Groundwater Extraction (Containment Only), New Treatment Plant, Discharge to Chisholm Creek; GWU3-4 – Groundwater Extraction (Containment and Interior Extraction), Treatment at

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whereas some limited environmental monitoring and periodic reviews are incorporated into the no action alternatives for other groundwater units (more similar to alternative GWU2-2); therefore, the cost estimate for GWU2-1is incommensurable with the other 'no action' alternatives evaluated in the FS and summarized herein.

either the Gilbert and Mosley GWTP or a New Treatment Plant, and Discharge; and, GWU3-5 – Groundwater Extraction (Containment and Interior Extraction (Additional Wells), Treatment at either the Gilbert and Mosley GWTP or a New Treatment Plant, and Discharge.

### 7.3.1. Alternative GWU3-1 – No Action

For the purpose of the FS, for GWU-3, the No Action alternative includes source abatement measures, limited environmental monitoring, and periodic reviews for a period of 70 years followed by plugging and abandonment of the monitoring well network. The present value cost for Alternative GWU3-1 is $2,192,000.

### 7.3.2. Alternative GWU3-2 – Groundwater Extraction (Containment Only), Discharge after Treatment at the Gilbert and Mosley GWTP

This alternative provides hydraulic containment for the majority of the GWU-3 plume through operation of two extraction wells pumping at a collective rate of approximately 205 gallons per minute. Contamination will continue to migrate beyond the Site boundary but will be captured by recovery wells associated of the Coleman Downtown or Gilbert and Mosley GWTP remedial system. In the event of shutdown of the Coleman recovery wells, an additional contingency well will be installed to ensure containment. Contaminated groundwater will be pumped to the Gilbert and Mosley GWTP where it would be treated by air stripping before being discharged to the Arkansas River under a NPDES permit. One extraction well is expected to pump for 70 years, the other well is expected to operate for 56 years after which the monitoring and extraction wells would be plugged and abandoned. Periodic groundwater sampling and site reviews would be conducted throughout the remedial action to monitor the effectiveness of the groundwater containment system. Costs for decommissioning of the Gilbert and Mosley GWTP are not included. The present value cost for Alternative GWU3-2 is $11,304,000.

### 7.3.3. Alternative GWU3-3 – Groundwater Extraction (Containment Only), New Treatment Plant, Discharge to Chisholm Creek

This alternative shares many common elements with GWU3-3 with the primary difference being that a new treatment plant with an air stripper would be constructed on city-owned property near the proposed extraction wells. Treated groundwater would be discharged to Chisholm Creek under a NPDES permit. Costs for decommissioning of the new treatment plant are included in this alternative. The present value cost for Alternative GWU3-3 is $12,784,000.

### 7.3.4. Alternative GWU3-4 – Groundwater Extraction (Containment and Interior Extraction), Treatment at Either the Gilbert and Mosley GWTP or a New Treatment Plant, and Discharge

This alternative provides the same downgradient hydraulic containment configuration as alternatives GWU3-2 and GWU3-3 but also provides interior treatment. Water from the downgradient extraction wells would be pumped to the Gilbert and Mosley GWTP where it would be treated by air stripping before being discharged to the Arkansas River under a NPDES permit. Operational timeframe and pumping rates for the downgradient wells are consistent with those outlined for GWU3-2. As proposed, the in plume extraction well would be pumped at a

rate of approximately 110 gallons per minute for an estimated 70 years. Groundwater recovered from the in-plume extraction wells would be pumped to a new treatment plant with an air stripper, which would be constructed on city-owned property near the proposed extraction well. Treated groundwater would be discharged to Chisholm Creek under a NPDES permit. Periodic groundwater sampling and site reviews would be conducted throughout the remedial action to monitor the effectiveness of the groundwater containment system. Costs for decommissioning of the new treatment plant are included but costs for decommissioning of the Gilbert and Mosley GWTP are not included. The present value cost for Alternative GWU3-4 is $16,422,000.

#### *7.3.5. Alternative GWU3-5 – Groundwater Extraction (Containment and Interior Extraction (Additional Wells)), Treatment at Either the Gilbert and Mosley GWTP or a New Treatment Plant, and Discharge*

This alternative expands on Alternative GWU3-4 to include additional in-plume extraction wells. Water from the downgradient extraction wells would be pumped to the Gilbert and Mosley GWTP while groundwater extracted from in-plume wells would be pumped to a new treatment plant with an air stripper before being discharged to Chisholm Creek under a NPDES permit. As proposed, the in-plume wells would pump at a cumulative rate of 200 gallons per minute for times ranging from 28 to 70 years. This alternative also includes installation of additional contingency recovery wells that would be installed in the event that surface water monitoring in Chisholm Creek indicates the need for such. Periodic groundwater sampling and site reviews would be conducted throughout the remedial action to monitor the effectiveness of the groundwater containment system. Costs for decommissioning of the new treatment plant are included but costs for decommissioning of the Gilbert and Mosley GWTP are not included. The present value cost for Alternative GWU3-5, not including contingency implementation, is $25,776,000.

### *7.4. Groundwater Unit 4*

Four remedial action alternatives were retained for detailed analysis for GWU-4. Other than the requisite No Action alternative (GWU4-1), each alternative was a variation of groundwater extraction and treatment: GWU4-2 – Groundwater Extraction (Containment Only), Discharge after Treatment at the Gilbert-Mosley GWTP; GWU4-3 – Groundwater Extraction (Containment Only), New Treatment Plant, Discharge to Storm Sewer; and, GWU4-4 – Groundwater Extraction (Containment and Interior Extraction), Treatment at Either the Gilbert-Mosley GWTP or a new Treatment Plant, and Discharge.

#### *7.4.1. Alternative GWU4-1 – No Action*

For the purpose of the FS, for GWU-4, the No Action alternative includes source abatement measures, limited environmental monitoring, and periodic reviews for a period of 28 years followed by plugging and abandonment of the monitoring well network. The present value cost for Alternative GWU4-1 is $1,418,000.

### 7.4.2. Alternative GWU4-2 – Groundwater Extraction (Containment Only), Discharge after Treatment at the Gilbert and Mosley GWTP

This alternative provides hydraulic containment of the GWU-4 plume through operation of a single extraction well installed near the downgradient boundary of GWU-4. CDM estimates that a single well pumping at a rate of approximately 120 gallons per minute will be sufficient to capture the GWU-4 plume. Contaminated groundwater will be pumped to the Gilbert and Mosley GWTP where it would be treated by air stripping before being discharged to the Arkansas River under a NPDES permit. The extraction well is expected to operate for a period of 28 years after which monitoring and extraction wells would be plugged and abandoned. Periodic groundwater sampling and site reviews would be conducted throughout the remedial action to monitor the effectiveness of the groundwater containment system. Costs for decommissioning of the Gilbert and Mosley GWTP are not included. The present value cost for Alternative GWU4-2 is $3,745,000.

### 7.4.3. Alternative GWU4-3 – Groundwater Extraction (Containment Only), New Treatment Plant, Discharge to Storm Sewer

This alternative shares many common elements with GWU4-2 with the primary difference being that a new treatment plant with an air stripper would be constructed on city-owned property near the proposed extraction well. Treated groundwater would be discharged to the storm sewer. Costs for decommissioning of the new treatment plant are included in this alternative. The present value cost for Alternative GWU4-3 is $5,373,000.

### 7.4.4. Alternative GWU4-4 – Groundwater Extraction (Containment and Interior Extraction), Treatment at Either the Gilbert and Mosley GWTP or a new Treatment Plant, and Discharge

This alternative includes the extraction well identified in alternatives GWU4-2 and GWU4-3 in addition to one interior well pumping at a rate of approximately 100 gallons per minute. Extracted groundwater from the interior well would be routed to a new treatment plant with an air stripper. Extracted groundwater from the downgradient well would be routed either to the Gilbert and Mosley GWTP or the new treatment plant. The extraction wells are expected to operate for a period of 18 years (10 years less than under Alternatives GWU4-2 or GWU4-3) after which the wells would be plugged and abandoned. Periodic groundwater sampling and site reviews would be conducted throughout the remedial action to monitor the effectiveness of the groundwater containment system. The alternative also includes installation of two contingency in-plume extraction wells should future monitoring data indicate unacceptable impacts to Chisholm Creek. Costs for decommissioning of the new treatment plant are included but costs for decommissioning of the Gilbert and Mosley GWTP are not included. The present value cost for Alternative GWU4-4, not including contingency implementation is $7,298,000.

## 7.5. Groundwater Unit 5

The FS did not identify or evaluate remedial action alternatives for GWU-5. A separate FS will be prepared for GWU-5 in the future.

### 7.6. Groundwater Unit 6

The FS did not identify or evaluate remedial action alternatives for GWU-6. A separate FS will be prepared for GWU-6 in the future.

## 8. Description of the Preferred Remedy

After evaluation of the individual analysis of remedial action alternatives, a comparative analysis of the various alternatives for each GWU was performed with consideration of the threshold and balancing criteria specified in the NCP. The results of the comparative analysis in combination with subsequent correspondence between KDHE and the City of Wichita support the preferred remedy for each GWU outlined below and presented in Table 8-1. The total present value cost of the preferred remedy is $29,200,076 as presented in Table 8-2. Individual source abatement is central to the overall success of any site-wide remedial action. Therefore, to highlight the importance of this aspect, source abatement has been explicitly incorporated into the preferred remedial strategy for each GWU. Figure 8-1 identifies the preliminary preferred remedial action alternative (including proposed extraction well and contingency extraction well locations) for interim groundwater remediation at the NIC Site for each GWU.

### 8.1. Common Elements of the Preferred Remedy

While the FS and final CAD evaluate remedial action alternatives on an individual basis, there are a number of common elements that are summarized below.

- *Pre-design Data Acquisition* – For each GWU, pre-design data acquisition activities will be conducted to optimize the selected remedy. A summary of anticipated pre-design data acquisition activities is presented in Table 8-1. Based on pre-design data acquisition findings, the exact number and placement of extraction wells may vary and/or contingency implementation may be required to ensure protection of human health and the environment and satisfy ARARs.

- *Long-term Groundwater and Surface Water Monitoring* – A comprehensive groundwater and surface water monitoring plan will be developed to evaluate the performance of the preferred remedy and monitor for contaminant impact to nearby streams and migration beyond groundwater unit and site boundaries.

- *Five-year Reviews* – Five-year reviews will be conducted as long as contamination remains at the NIC Site at concentrations above levels which would permit unrestricted use. These reviews provide an opportunity to review the overall protectiveness and effectiveness of the remedial strategy.

- *Institutional controls* – City of Wichita Municipal Code of Ordinances, Title 7, Chapter 7.30, Section 7.30.105 currently prohibits the installation of new and use of pre-existing water wells for personal use in contaminated areas (such as the NIC Site). Continued enforcement of this ordinance will help ensure protection of human health until site cleanup is complete.

### 8.2. Groundwater Unit 1

The ultimate objective for groundwater in GWU-1 is to restore the groundwater resource to allow for its most beneficial use. This aquifer could be used as a future source of drinking water, but it is not currently being used for this purpose. On the basis of information obtained during the RI, Alternative GWU1-2, Source Abatement and MNA, with a groundwater extraction and treatment contingency (e.g., Alternative GWU1-4), may facilitate groundwater restoration within a reasonable timeframe. However, additional data are needed to fully support this determination. For this reason, a rigorous MNA assessment consistent with KDHE and EPA guidance, for a period not to exceed two years, is incorporated into the remedial design phase for GWU-1. If the data collected during the assessment indicate that MNA is not effective at reducing contaminant concentrations throughout the groundwater unit or does not preclude further contaminant migration, the contingency (including optimization of extraction well(s) placement) will be implemented. In addition, during the MNA assessment, additional sampling will be performed east of the East Fork of Chisholm Creek to determine the magnitude and extent of contamination in this area. Should the investigation find contamination at concentrations in excess of ATGs/MCLs in the area east of the Creek, contingency EAB biobarriers will be installed to restore groundwater and preclude further contaminant migration. With consideration of identified contingencies, this alternative is protective of human health and the environment and satisfies regulatory requirements.

### 8.3. Groundwater Unit 2

The ultimate objective for groundwater in GWU-2 is to restore the groundwater resource to allow for its most beneficial use. This aquifer could be used as a future source of drinking water, but it is not currently being used for this purpose. On the basis of information obtained during the RI, Alternative GWU2-4a, Source Abatement and Groundwater Extraction and Treatment, is KDHE's preferred alternative for GWU-2, with inclusion of the modifications/enhancements discussed below. Contaminated groundwater will be pumped to a new treatment plant where it will be treated by air stripping before being discharged to Chisholm Creek under a NPDES permit. During the remedial design phase, a detailed groundwater investigation in the area east of Chisholm Creek will be conducted. Should the investigation find contamination at concentrations in excess of ATGs/MCLs in the area east of the Creek, contingency EAB biobarriers will be installed to restore groundwater and preclude further contaminant migration. In addition, depending on the effectiveness of the proposed remedy during the initial operational period, additional extraction well(s) may be installed as a contingency. With consideration of identified contingencies, this alternative is protective of human health and the environment and satisfies regulatory requirements.

### 8.4. Groundwater Unit 3

The ultimate objective for groundwater in GWU-3 is to restore the groundwater resource to allow for its most beneficial use. This aquifer could be used as a future source of drinking water, but it is not currently being used for this purpose. On the basis of information obtained during the RI, Alternative GWU3-4, Source Abatement and Groundwater Extraction (Containment and Interior Extraction) and Treatment at both the Gilbert and Mosley GWTP and a new GWTP with

discharge to the Arkansas River and Chisholm Creek, is KDHE's preferred alternative for GWU-3 with inclusion of the modifications/enhancements below. This alternative provides hydraulic containment at the southern NIC Site boundary and in-plume treatment for mass removal. In the event that surface water monitoring in Chisholm Creek shows contaminant levels attributable to NIC Site groundwater exceeding the designated uses concentration limits within the creek, additional contingency extraction wells will be installed to provide additional migration control. With consideration of identified contingencies, this alternative is protective of human health and the environment and satisfies regulatory requirements.

### 8.5. Groundwater Unit 4

The ultimate objective for groundwater in GWU-4 is to restore the groundwater resource to allow for its most beneficial use. This aquifer could be used as a future source of drinking water, but it is not currently being used for this purpose. Alternative GWU4-2, Groundwater Extraction and Treatment at the Gilbert and Mosley GWTP is KDHE's preferred alternative for GWU-4. This alternative includes source abatement, and provides hydraulic containment of the GWU-4 plume at the southern NIC site boundary with treated. Depending on future monitoring data, a contingency for an additional recovery well(s) may be implemented. With consideration of identified contingencies, this alternative is protective of human health and the environment and satisfies regulatory requirements.

### 8.6. Groundwater Unit 5

This final CAD does not identify KDHE's preferred remedial alternative for GWU-5. A separate decision document for GWU-5 will be developed upon completion of the FS for the groundwater unit.

### 8.7. Groundwater Unit 6

This final CAD does not identify the KDHE's preferred remedial alternative for GWU-6. A separate decision document for GWU-6 will be developed upon completion of the FS for the groundwater unit.

## 9. Community Involvement

A Public Relations Strategy for the Site was developed by KDHE. KDHE has encouraged public input and comment throughout the process. On January 6, 2012, KDHE issued a public notice in *The Wichita Eagle* announcing the availability of the draft CAD and the public comment period offered from January 6 to February 6, 2012. As per the Public Relations Strategy, the notice included information for the public availability session and hearing held on February 1, 2012, where the public was given additional opportunity to ask questions and provide comments on the draft CAD. In addition, KDHE established a webpage dedicated to the NIC Site, which has been made available online, and continues to be available online at http://www.kdheks.gov/remedial/site_restoration/nic.html. Notice of the public availability session and hearing was posted on KDHE's NIC webpage. Many site documents, including this final CAD, are available on the webpage.

## 10. DOCUMENTATION OF MINOR CHANGES

Five written comment letters containing 19 specific comments were received by KDHE during the public comment period. In response to the comments received, KDHE has amended the draft CAD document as specified in Section 11. In addition, several minor changes were made to the draft CAD document based on further internal review.

## 11. RESPONSIVENESS SUMMARY

The purpose of this section is to review and provide responses to comments received during the public comment period for the draft CAD. The comment letters were received from CDM Smith, Inc., U.S. EPA, El Paso Corporation, Southwind Group of the Sierra Club, and Arcadis U.S., Inc.. The comments *(italics)* and KDHE's responses (**bold**) are shown below.

*Comment #1:* *Page 9 references a Figure 2-2 which identifies the various source areas and their primary COCs. I don't see a Figure 2-2 in the document although Figure 3-4 (referenced later) appears to be this.*

**Response #1:** **KDHE has modified the CAD to reference the correct Figure (i.e., Figure 3-4 changed to Figure 2-2).**

*Comment #2:* *I didn't see a reference in the text to Figure 8-1.*

**Response #2:** **KDHE has modified the CAD to reference Figure 8-1.**

*Comment #3:* *This is clarification to a statement made in section 4.2.1 Coleman North on page 16. The second sentence states "Contaminated groundwater is treated by air stripping before being discharged under a NPDES permit or reused by the current facility operator." The EPA understands that contaminated groundwater is extracted by an industrial well, piped into the facility in a closed system to be used as coolant for research and development purposes, and then piped to the air stripper for remediation prior to discharge under the NPDES permit. The second sentence is misleading by using the term reuse, which typically refers to "use after treatment." The EPA recommends that sentence be revised to provide clarification of the current system. There is a second groundwater extraction well south of the industrial well which provides containment of the contaminated groundwater and is pumped to the air stripper for treatment prior to discharge under the NPDES permit.*

**Response #3:** **KDHE has modified the CAD to clarify the operations of the current remedial system operating at the Coleman North Site.**

*Comment #4:* *It is EPA's understanding that the Draft Corrective Action Decision (CAD) assumes that the existing action being implemented at the Coleman Operable Unit will continue under EPA oversight pursuant to the Consent Decree in*

*addition to the proposed additional actions to be implemented at Groundwater Unit 2 (GWU-2) of NIC. As you are aware the EPA has federal consent decree with three defendants signed in 1993 to implement the Record of Decision (ROD) signed in 1992. The site name is Coleman Operable Unit, 29th & Mead Site, Wichita Kansas (Sedgwick County). This operable unit is referred to as Coleman North in section 4.2.1 of the draft CAD. The remedial action to be implemented was to contain and treat the contaminated groundwater to prevent the migration of the contaminants off the Coleman Operable Unit onto the 29th and Mead Site [now expanded and called the North Industrial Corridor (NIC)] and to treat the contaminated soils to prevent further contamination of the groundwater.*

**Response #4:** ***EPA's assumption is correct regarding continued operation of the treatment system at the Coleman North Site. In the event this system is shut down in the future, KDHE will coordinate with the City of Wichita to determine what if any further remedial action in the area is warranted at that time. Any changes will be properly documented in the administrative record file.*** **This comment did not result in changes to the CAD.**

*Comment #5:* *On Figure 3-4, Known and Suspected Source Areas, there is a list of the primary source contaminants underneath each source. Some of these source contaminants are followed by a question mark. The meaning of a source contaminant followed by a question mark should be explained in the figure legend.*

**Response #5:** **Comment acknowledged. The question mark aside the source contaminant indicates that there may be some uncertainty regarding whether a contaminant is attributable to a particular source area. This comment did not result in changes to the CAD.**

*Comment #6:* *Within Section 3.4, Delineation of Groundwater Units, the first sentence of Subsection Groundwater Unit 2 (GWU-2) may suggest to some readers that all source areas within GWU-2 are associated with chlorinated solvent contamination. However, the primary source contaminants for several source areas in GWU-2, such as the Former Golden Rule Refinery and Former Barnsdall Refinery are associated with petroleum hydrocarbons. El Paso Merchant Energy – Petroleum Company (EPME-PC) suggests rewording of this paragraph to clarify this point.*

**Response #6:** **KDHE has modified the CAD to clarify this point.**

*Comment #7:* *Within Section 3.4, Delineation of Groundwater Units, the first sentence of Subsection Groundwater Unit 5 (GWU-5) states that the former Coastal Derby Refinery Site is located adjacent to the West Fork of Chisholm Creek. The*

*former Coastal Derby Refinery Site is actually located adjacent to the East Fork of Chisholm Creek.*

**Response #7: KDHE has modified the CAD to reference the correct Creek.**

*Comment #8: As stated throughout the DCA, the objective of the remediation of this site is to protect human health and the environment and as noted in Highlight 6-1 in the DCA the third objection listed is to "Restore groundwater to allow for its most beneficial uses (e.g., drinking water) and see also Sections 8.2, 8.3, 8.4 and 8.5 in the document. On the other hand, the cleanup level for TCE is established at 21 micrograms per liter under the alternate treatment goal (Section 6.1 and Table 6-1.) This level is inconsistent with the federal MCL of 5 micrograms per liter and is not protective of human health in drinking water. The higher ATG level is predicted on the fact that the City of Wichita has an ordinance prohibiting the use of groundwater for drinking purposes within the boundaries of the NIC area.*

*There are two problems with the ATG level: 1) as noted it is inconsistent with the goal of restoring groundwater within the area to drinking water standards and 2) predicting the acceptance of the ATG level (21 ug/l) on the fact that the city prohibits using groundwater for drinking purposes (or "personal use"-see Section 8.1) would demand that the city monitor and enforce that rule. We are unaware of any such monitoring or enforcement procedures. Indeed, anecdotal evidence suggests that some homeowners in the NIC area with personal wells are unaware of the city ordinance and as Section 5 of the Draft CAD points out non-cancer health risks for outdoor use have a Hazard Index of 2 and 3.*

**Response #8: The CAD proposes that the groundwater in the entire NIC area will be remediated and cleaned up to federal drinking water standards (MCLs) (e.g., TCE 5 ug/l, and so on) through a combination of natural and technological means where groundwater above the ATG (TCE 21 ug/l) will be targeted for active, technological remediation (e.g., groundwater extraction and treatment). Extracted groundwater will be treated to levels below the MCLs at the surface by air strippers for the contaminants of concern (i.e., treated water will be within acceptable risk levels following treatment by the air stripper). This will restore groundwater within the area to drinking water standards, and allow for its most beneficial uses (e.g., drinking water). As discussed in the CAD, the City of Wichita Municipal Code of Ordinances, Title 7, Chapter 7.30, Section 7.30.105 prohibits the installation of new water wells and use of pre-existing water wells for personal use (drinking, cooking, bathing, etc.) in contaminated areas (such as the NIC Site). Under the City Ordinance, the City Health Officer/Director of the Department of Environmental Health is responsible for the enforcement of the chapter and is authorized to make investigations,**

**inspections, issue notices, orders, and directions, to take actions and carry out activities as necessary for the enforcement of the chapter. This comment did not result in changes to the CAD.**

*Comment #9:* *A relatively minor point that concerns us is air stripping. As with the air stripping of the effluent from the Gilbert and Mosley site, we are concerned with the idea of trading one vector of pollution (water) for another (air). The Draft CAD is rather nebulous in suggesting that additional treatment (e.g., use of activated carbon filters) will be used when necessary. How is that necessity determined and by whom? We believe the public should be informed regarding the impacts (or lack thereof) to the atmosphere surrounding any air stripper.*

**Response #9:** **Any contaminants released to the air by the remedial systems will be required to meet and be in compliance with all Kansas Air Pollution Emission Control Regulations. The need to treat the emissions from the air strippers with carbon filters or other devices will be assessed by KDHE Bureau of Air during the Remedial Design Phase. KDHE believes the proposed action is protective of health and environment and that its implementation will not pose a threat to human health. This comment did not result in changes to the CAD.**

*Comment #10:* *An editorial comment: On page 9 of the Draft CAD a reference is made to Figure 2-2. Figure 2-2 does not exist in the document.*

**Response #10:** **Please see response to Comment #1.**

*Comment #11:* *I recognize that the 30-day comment period began January 6, 2012. However, many people did not know of that until the date of the hearing held February 1. I was told the January 6 announcement appeared in the Wichita Business Journal back in January, but I don't read that publication. Apparently it was also submitted to the Eagle, but they chose not to publish it and there's little you can do about that other than taking out an ad. I suggest you move your public hearings up a week so in the comment period so as to give more "breathing room" for those who wish to comment following the hearing.*

**Response #11**: **Comment acknowledged. The public notice was published in the Wichita Eagle on January 6, 2012 in the legal publication section. A legal record of affidavit was recorded by the Wichita Eagle Record Clerk on January 6, 2012 confirming the notice of publication in the January 6, 2012 Wichita Eagle edition. This comment did not result in changes to the CAD.**

*Comment #12:* *Why does the KDHE refer to the CAD as the Corrective Action Decision for Interim Groundwater Remediation? The Feasibility Study was entitled as "Site-Wide Groundwater Feasibility Study – North Industrial Corridor Site." The FS*

*document was portrayed by the City of Wichita to the NIC Participants as the final Feasibility Study for the site-wide groundwater. Please explain the significance of the "interim" remediation designation being used by the KDHE and how this affects the State Cooperative Program process.*

**Response #12: Given the requirement in the NIC Settlement Agreement in 1995 to ensure that source area remedial actions are consistent with the final NIC site-wide remedy, KDHE has issued the Draft CAD for Interim Groundwater Remediation to facilitate site-wide groundwater remediation efforts in the near term and will prepare a separate CAD dealing with the site in total once the remedial strategy for each source area has been determined. As the majority of source area interim measures in the NIC Site have been limited to the actual source area properties to date, this will allow the final remedy to account for the expanded remedial actions that will be necessary at individual source areas. This will ensure that the final remedy for the site as a whole is consistent with the various source area remedies. This comment did not result in changes to the CAD.**

*Comment #13: Why are Groundwater Unit 5 and Groundwater Unit 6 going to be evaluated by the KDHE under a separate Feasibility Study?*

**Response #13: The City of Wichita proposed to separate the Feasibility Study components for GWU-5 (Former Coastal Derby Refinery Facility) and GWU-6 (USD #259 Facility) since both of these areas are comprised of a single source area and the associated responsible parties will prepare feasibility studies for these areas under consent agreements with KDHE. KDHE concurred with the City of Wichita's proposal. This comment did not result in changes to the CAD.**

*Comment #14: The footnote in Table 8-1 indicates the KDHE maintains reservations regarding the efficacy of MNA for GWU-1. Please provide a detailed explanation of KDHE's concern. If a significant concern exists, why has the KDHE approved MNA as a significant portion of the selected remedy?*

**Response #14: As indicated in the CAD, the existing data are insufficient to demonstrate that MNA will be successful in reducing contaminant concentrations to acceptable levels across Groundwater Unit 1; however, KDHE agrees, as per the proposed remedy, that it may be worthwhile to collect additional data to evaluate MNA consistent with State and Federal policy and guidance. KDHE's preferred remedy accounts for the uncertainty associated with the performance of MNA by establishing a contingent remedy for implementation in the case that additional data indicate MNA will not be successful. This comment did not result in changes to the CAD.**

*Comment #15: What are the specific criteria that the KDHE will utilize to judge the efficacy of MNA at Groundwater Unit 1 after the initial 2 year MNA assessment period?*

**Response #15: KDHE will evaluate the efficacy of MNA at Groundwater Unit 1 based on and constituent with KDHE's-BER MNA Policy requirements, and available USEPA guidance. If the data indicate that MNA will not be effective, KDHE will require contingency implementation. This comment did not result in changes to the CAD.**

*Comment #16: What are the specific criteria that will be used by the KDHE to determine if active groundwater extraction will be required after the initial 2 year MNA period?*

**Response #16: Please see the response to Comment 15.**

*Comment #17: In Table 8-2, the preferred alternative for Groundwater Unit 1 is presented as GWU1-2: Source Abatement and MNA with a present value cost of $5,532,000. However, in Section 8.2 of the CAD, the KDHE's selects a preferred remedy consisting of Alternative GWU1-2 Source Abatement and MNA combined with a groundwater extraction and treatment contingency (i.e., Alternative GWU1-4). Detailed costs for this combined alternative were not even calculated or presented in the Feasibility Study or CAD. Therefore, an adequate evaluation of this combined alternative cannot by fully evaluated by Coleman or the general public. Coleman requests the necessary cost analysis for the selected remedy be included as part of the CAD. Coleman offers this example as one of the reasons it believes the remedial alternatives evaluation and costing process are flawed and not transparent enough to allow for the selection of the preferred remedy at Groundwater Unit 1.*

**Response #17: The comment is acknowledged. Contingency implementation is not factored into the cost estimate since the need for (and scope of) contingency implementation is currently unknown pending further study. In any event, KDHE anticipates that the cost for the groundwater extraction and treatment contingency (in lieu of MNA) would be approximately equivalent to the cost for implementation of Alternative GWU1-4 - $8,497,000. This comment did not result in changes to the CAD.**

*Comment #18: There is a discrepancy in the remediation costs presented in CAD. The costs for Alternative GWU1-4: Source Abatement and Groundwater Extraction and Treatment (50 gpm system) have a present worth cost of $8,497,000 for Groundwater Unit 1 (section 7.1.4 in CAD), while the costs for the preferred alternative GWU2-4a: Source Abatement and Groundwater Extraction and Treatment (150 gpm system) at Groundwater Unit 2 have a present worth cost of $3,501,076. The above documents indicate the operational period for both*

*extraction systems is 42 years and that the costs do not include source abatement or contingency remediation. Please explain in detail how the costs for a smaller groundwater extraction and treatment which operates the same length of time (i.e., 42 years) can be significantly higher for Groundwater Unit 1 as compared to Groundwater Unit 2. Coleman offers this example as another reason why it believes the remedial alternatives evaluation and costing process is flawed and not transparent to the readers.*

**Response #18: As indicated in the CAD, the evaluation of alternatives for GWU-2 was prepared by Shaw Environmental whereas the evaluations for GWU-1, GWU-3, and GWU-4 were prepared by CDM. While there are certainly differences in the methodology and resultant costs used and developed by each consultant, the cost information is sufficient to help evaluate and select appropriate remedial alternatives on an operable unit specific basis. Additional detail regarding the cost estimating process is available in the feasibility study. This comment did not result in changes to the CAD.**

*Comment #19: In Section 8.4 it is unclear on where the water from the downgradient extraction wells in Groundwater Unit 3 will be treated. In the Feasibility Study, one of the options included using the existing Coleman Downtown Wichita Facility groundwater remediation wells RW-5, RW-6, and RW-7 to hydraulically capture and treat contaminants leaving Groundwater Unit 3. Please clarify whether the CAD contemplates the use of the Coleman Downtown Wichita Facility as part of the preferred remedy.*

**Response #19: As presented in the feasibility study, groundwater in some areas of the NIC site may migrate beyond the site boundary and be captured by existing downgradient extraction wells. In the event these wells are decommissioned in the future, additional extraction wells will be installed to ensure continued containment of groundwater associated with the NIC Site. KDHE has modified the CAD to clarify this point.**

# TABLES

## *Table 3-1 – Analytical Results Summary for Groundwater Target Compounds*

| Compound | Maximum Concentration† (2007-8) µg/L | Frequency of Detection† (2007-8) | Location of Maximum Concentration‡ | MCL or KDHE Tier 2 Level‡ µg/L |
|---|---|---|---|---|
| PCE | 660 | 23.9% | GWU-1 (Unocal) | 5 |
| TCE | 8,600 | 68.6% | GWU-2 (Coleman North) | 5 |
| cis-1,2-Dichloroethene | 620 | 65.8% | GWU-1 (Unocal) | 70 |
| Vinyl chloride | 35.3 | 20.2% | NMW-05S | 2 |
| 1,1,1-Trichloroethane | 380 | 7.5% | GWU-2 (Coleman North) | 200 |
| 1,1-Dichloroethane | 370 | 23.0% | GWU-2 (Coleman North) | 25 |
| 1,1-Dichloroethene | 310 | 24.1% | GWU-2 (Coleman North) | 7 |
| Carbon tetrachloride | 645 | 3.1% | GWU-3 (Cargill) | 5 |
| Chloroform | 180 | 8.3% | GWU-3 (Cargill) | 80 |
| Benzene | 900 | 17.8% | GWU-5 (Coastal Derby Refinery) | 5 |

†*Percentage of 456 samples collected by CDM and others as reported in Tables 2-2 and 2-3 of the FS. Contaminant concentrations at individual source areas may be considerably higher than what is represented in this summary table.*

‡*KDHE Tier 2 Levels default to MCLs where available. Tier 2 Level for groundwater provided from KDHE's Risk Based Standards for Kansas (RSK) Manual, October, 2010.*

## *Table 5-1 – Summary of Risk Assessment Findings*

| Receptor And Exposure Scenario | Area South Of 17th Street | | Area North Of 17th Street | |
|---|---|---|---|---|
| | Cumulative Cancer Risk (RME) | Hazard Index (RME) | Cumulative Cancer Risk (RME) | Hazard Index (RME) |
| Current/Future Onsite Resident – Domestic Use of Groundwater | $2x10^{-2}$ | 162 | $2x10^{-2}$ | 542 |
| Current/Future Onsite Resident – Outdoor Use of Groundwater | $4x10^{-5}$ | 3 | $7x10^{-5}$ | 4 |
| Current/Future Onsite Resident – Inhalation Of Indoor Air | $4x10^{-6}$ | $2x10^{-2}$ | $5x10^{-6}$ | 1 |
| Current/Future Onsite Commercial Industrial Workers – Inhalation of Indoor Air | $4x10^{-7}$ | $1x10^{-3}$ | $5x10^{-7}$ | $4x10^{-3}$ |
| Future Construction Worker – Inhalation Of Ambient Air In An Excavation | $2x10^{-7}$ | $8x10^{-3}$ | $3x10^{-7}$ | $2x10^{-2}$ |

## *Table 6-1 – Cleanup Levels for Interim Groundwater Remediation for Groundwater Target Compounds*

| Compound | MCL or KDHE Tier 2 Level‡ | Alternate Treatment Goal |
|---|---|---|
| PCE | **5** | Not Established |
| TCE | **5** | **21** |
| cis-1,2-Dichloroethene | **70** | Not Established |
| Vinyl chloride | **2** | Not Established |
| 1,1,1-Trichloroethane | **200** | Not Established |
| 1,1-Dichloroethane | **25** | Not Established |
| 1,1-Dichloroethene | **7** | Not Established |
| Carbon tetrachloride | **5** | Not Established |
| Chloroform | **80** | Not Established |
| Benzene | **5** | Not Established |

‡*KDHE Tier 2 Levels default to MCLs where available. Tier 2 Level for groundwater provided from KDHE's Risk Based Standards for Kansas (RSK) Manual, October, 2010.*

## *Table 8-1 – Summary of the Preferred Alternative for Interim Groundwater Remediation*

| Groundwater Unit | Preferred Alternative | Pre-Design Data Acquisition | Contingency |
|---|---|---|---|
| Groundwater Unit 1 | GWU1-2: Source Abatement and MNA‡ | MNA assessment; detailed groundwater investigation east of the East Fork of Chisholm Creek; study of groundwater/surface water interactions | Groundwater Extraction and Treatment and/or Enhanced Anaerobic Bioremediation |
| Groundwater Unit 2 | GWU2-4a: Source Abatement and Groundwater Extraction and Treatment | Detailed groundwater investigation east of Chisholm Creek; study of groundwater/surface water interactions; study to support remedial system design | Additional extraction well(s) and/or Enhanced Anaerobic Bioremediation |
| Groundwater Unit 3 | GUW3-4: Source Abatement and Groundwater Extraction and Treatment | Study to support remedial system design; study of groundwater/surface water interactions | Additional extraction well(s) |
| Groundwater Unit 4 | GWU4-2: Source Abatement and Groundwater Extraction and Treatment | Study to support remedial system design | Additional extraction well(s) |
| Groundwater Unit 5 | To be determined through separate evaluation of remedial alternatives | | |
| Groundwater Unit 6 | To be determined through separate evaluation of remedial alternatives | | |

‡*KDHE maintains reservations regarding the efficacy of MNA for GWU-1.*

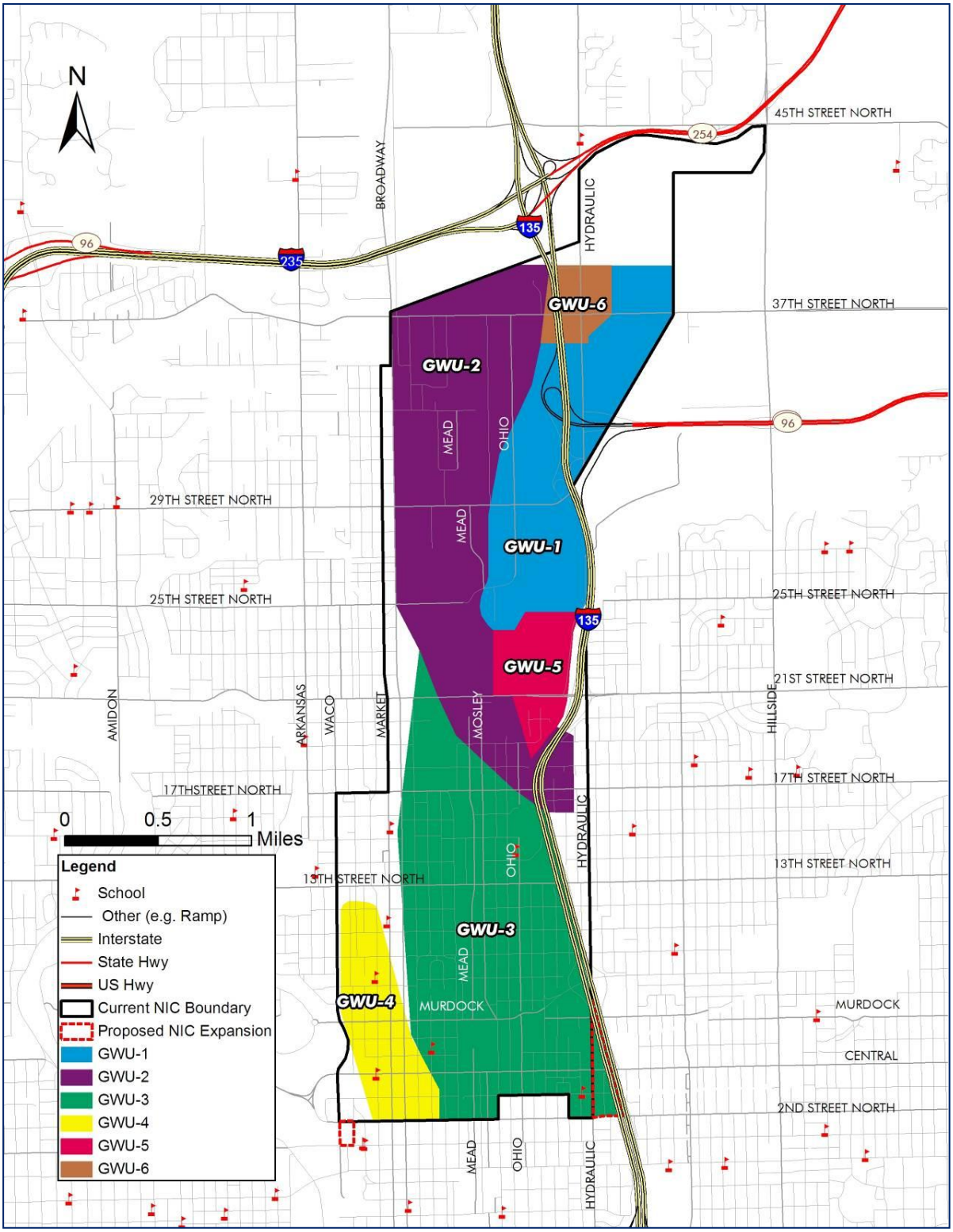
## *Table 8-2 – Estimated Cost of the Preferred Alternative for Interim Groundwater Remediation*

| Groundwater Unit | Preferred Alternative | Total Capital Cost | Total O&M Cost | Total Periodic Cost | Present Value Cost |
|---|---|---|---|---|---|
| Groundwater Unit 1 | GWU1-2: Source Abatement and MNA | $183,000 | $8,100,000 | $902,000 | $5,532,000 |
| Groundwater Unit 2 | GWU2-4a: Source Abatement and Groundwater Extraction and Treatment | $500,112 | $2,640,434 | $1,585,302 | $3,501,076 |
| Groundwater Unit 3 | GUW3-4: Source Abatement and Groundwater Extraction and Treatment | $2,631,000 | $21,074,000 | $3,364,000 | $16,422,000 |
| Groundwater Unit 4 | GWU4-2: Source Abatement and Groundwater Extraction and Treatment | $789,000 | $3,300,000 | $478,000 | $3,745,000 |
| Groundwater Unit 5 | To be determined through separate evaluation of remedial alternatives | | | | |
| Groundwater Unit 6 | To be determined through separate evaluation of remedial alternatives | | | | |
| | | | | ***Total Estimated Present Value Cost‡*** | **$29,200,076** |

*‡Costs estimated by CDM for GWU1, GWU-3, and GWU-4 and by Shaw Environmental and Infrastructure for GWU-2. Costs presented in the table above do not include source abatement activities or contingency implementation and may not include all necessary pre-design data acquisition activities. Actual costs for site-wide remedial actions are expected to be within the -30% to +50% range as specified in the National Oil and Hazardous Substances Pollution Contingency Plan. Costs for source abatement activities to be evaluated through source-specific feasibility studies.*

## *FIGURES*

## *Figure 2-1 – Site and Groundwater Unit Boundaries*



## *Figure 2-2 – Known and Suspected Source Areas*

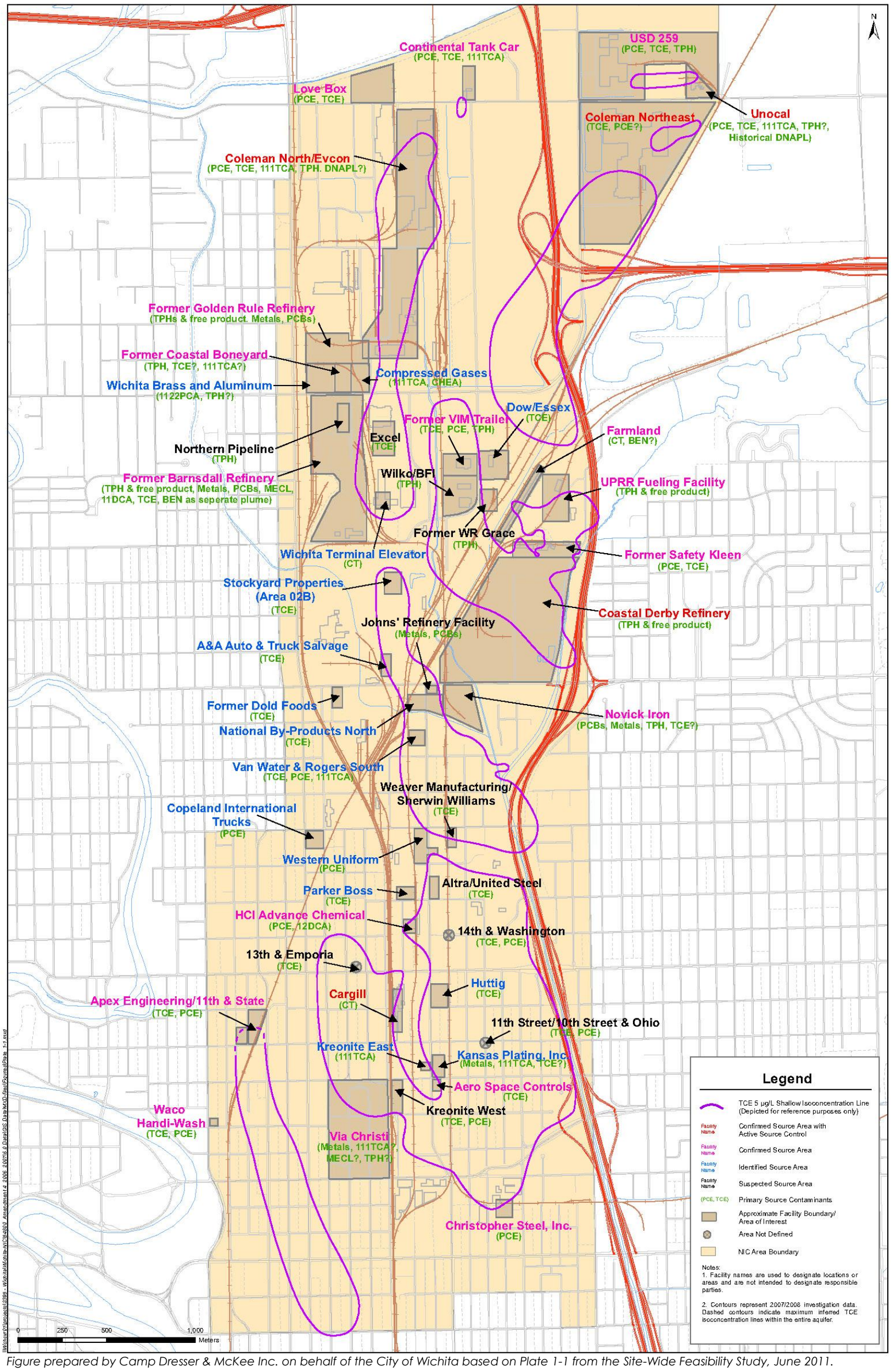



*Figure prepared by Camp Dresser & McKee Inc. on behalf of the City of Wichita based on Plate 1-1 from the Site-Wide Feasibility Study, June 2011.*

Kansas Department of Health and Environment
Environmental Remediation

***Figure 3-1 – Potentiometric Surface (2007-2008)***

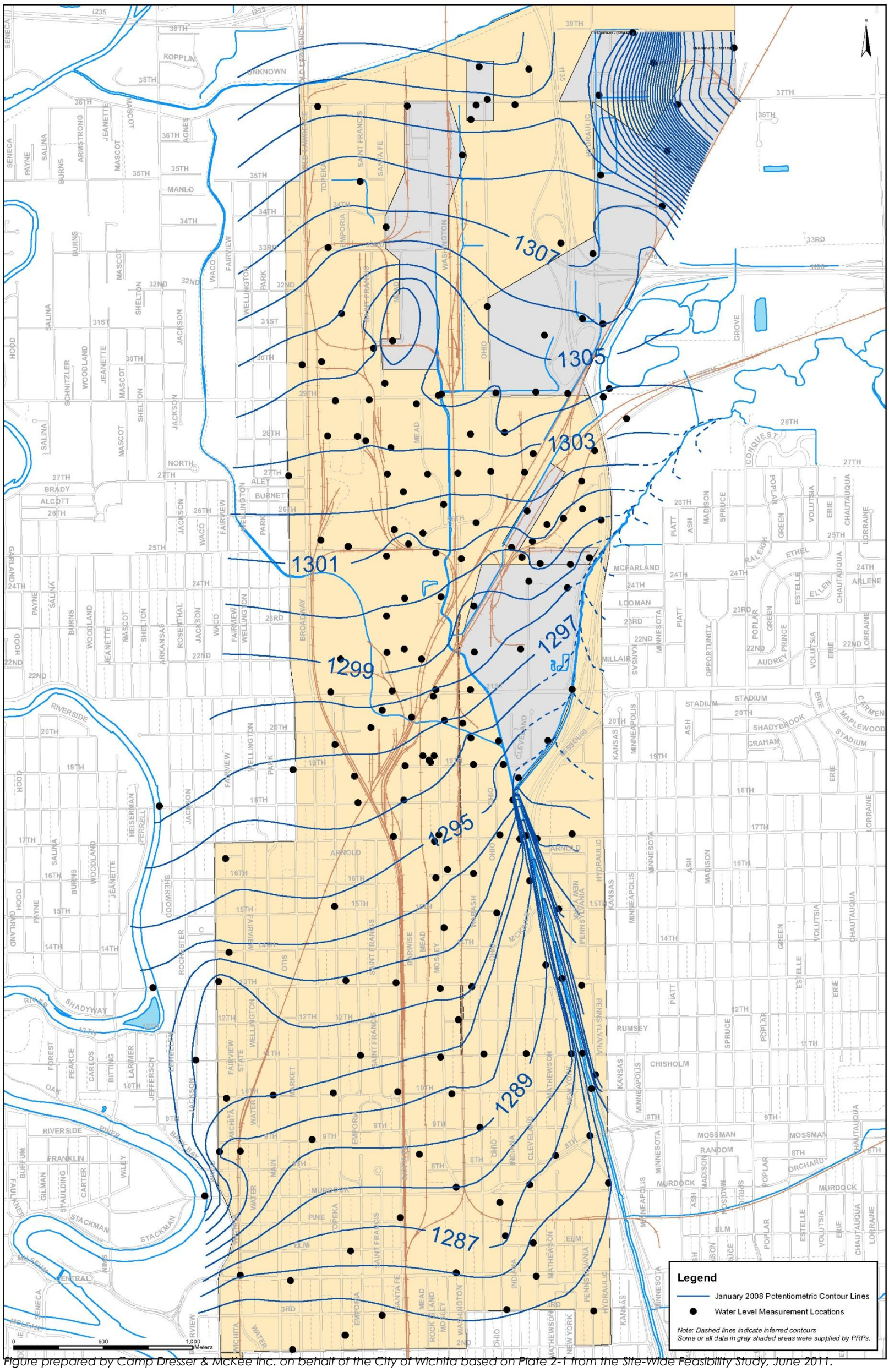



*Figure prepared by Camp Dresser & McKee Inc. on behalf of the City of Wichita based on Plate 2-1 from the Site-Wide Feasibility Study, June 2011.*

***Figure 3-2 – TCE in Shallow Groundwater***

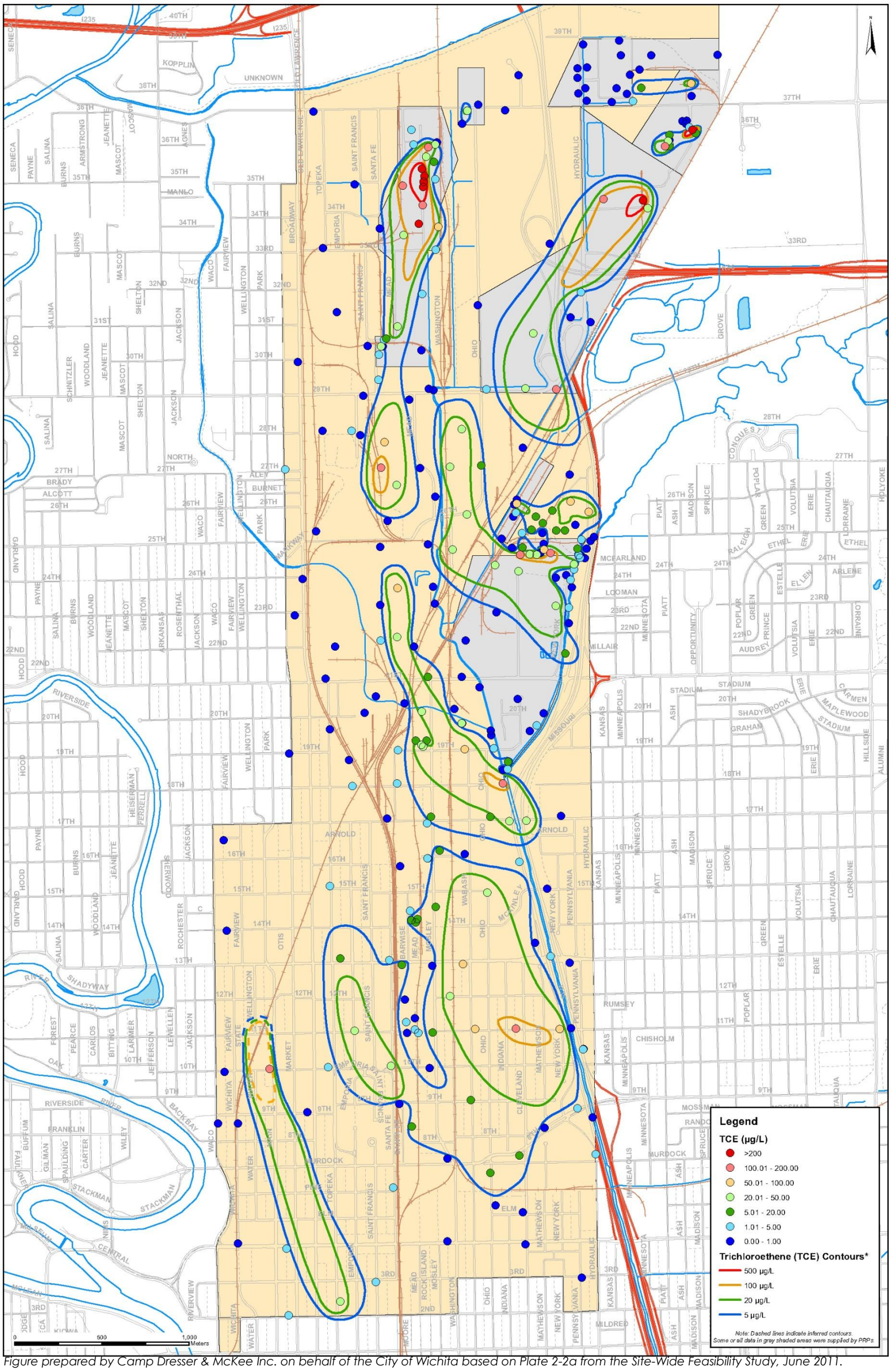



*Figure prepared by Camp Dresser & McKee Inc. on behalf of the City of Wichita based on Plate 2-2a from the Site-Wide Feasibility Study, June 2011.*

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***Figure 3-3 – TCE in Deep Groundwater***

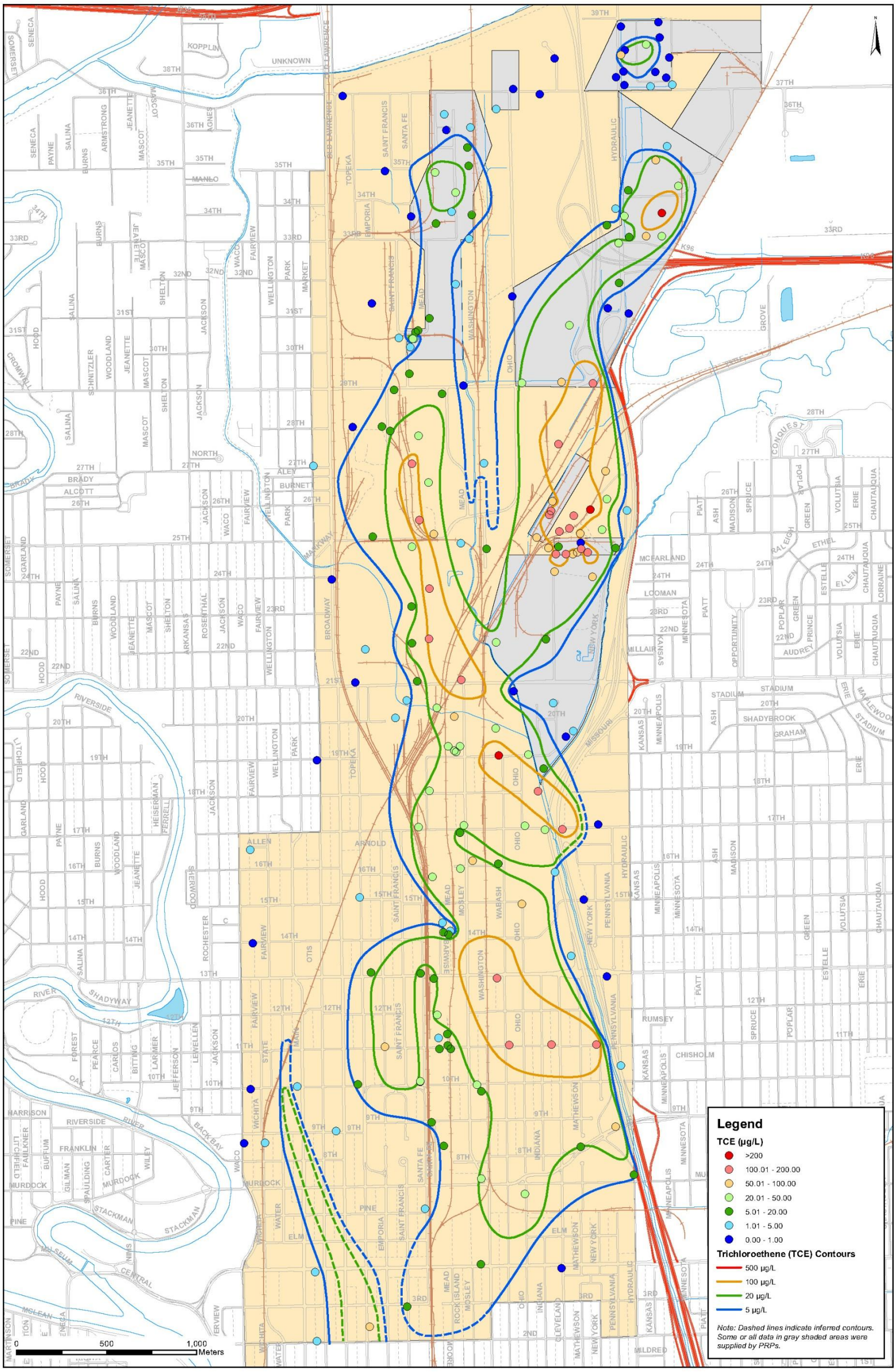


*Figure prepared by Camp Dresser & McKee Inc. on behalf of the City of Wichita based on Plate 2-2b from the Site-Wide Feasibility Study, June 2011.*

***Figure 8-1 – Preferred Alternative for Interim Groundwater Remediation (Preliminary Configuration)***